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Dressing and Truing of Abrasive Wheels for Surface Grinding Machines

By F. O. WYSE
The Blanchard Machine Co., Cambridge, Mass.

Distinction between dressing and truing—Both operations necessary in cylindrical grinding—Self-truing of wheels on heavy vertical surface grinding machines

AMONG those who use hollow-cylinder wheel surface grinding machines there seems to be considerable misunderstanding regarding the terms "wheel dressing" and "wheel truing." In this article the two terms have the following definitions:

To dress a wheel is to remove the dull abrasive grains from the cutting face or to strip off a loaded or glazed face so that unused and sharp grain edges may cut upon the work.

To true a wheel is to remove material from the surface of the wheel so that at grinding speed the grinding face will "run true."

When the operator of a cylindrical grinding machine uses his diamond on the wheel he ordinarily will take one or two heavy cuts across the face of the wheel and then one light cut. The first two passes of the diamond are to loosen and remove the dull abrasive grains or the glazed surface and may or may not leave a true surface; this is *dressing* the wheel. The light cut is to insure that all parts of the face are concentric; this is *truing* the wheel. Therefore it is quite natural for the user of cylindrical grinding machines to come to think of the two operations as one, usually spoken of as truing the wheel. This conception may cause little trouble so far as cylindrical grinding is concerned, but it leads to much misunderstanding when the single term is applied in the same manner for hollow-cylinder wheels used on massive and rigidly constructed surface grinding machines.

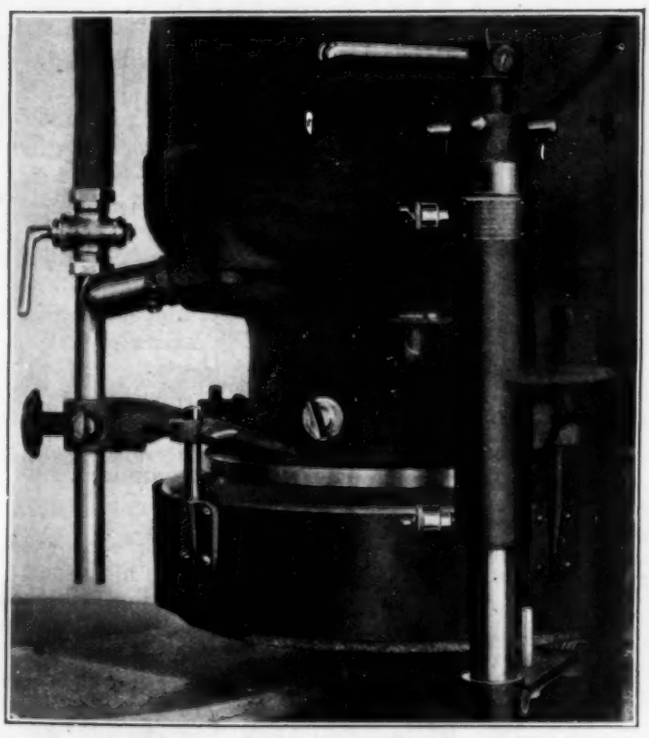

FIG. 1—WHEEL DRESSER OF BLANCHARD SURFACE GRINDING MACHINES

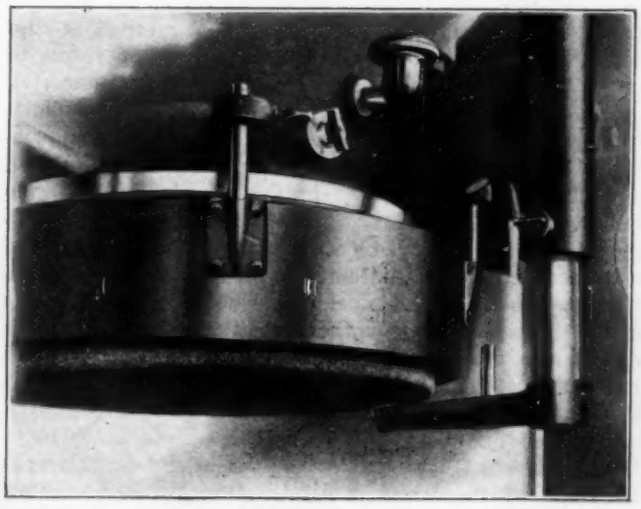

FIG. 2—SHOWING MANNER IN WHICH HUNTINGTON DRESSERS ARE APPLIED TO WHEEL

One manufacturer of vertical spindle surface grinding machines states that the hollow-cylinder wheels as used on his machine rarely, if ever, need truing. On the other hand, since the wheels used on this type of machine should be very soft and free cutting, dressing may be necessary when a hard wheel is encountered.

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For the sake of clearness, consider why the hard wheel needs dressing. In the ideal grinding wheel the bonding substance is just strong enough to hold the grains until they become dull. When the efficiency of a grain becomes too low, that is, when too much power is required to make it remove metal, the bonding substance breaks down and the grain is released.

But, we do not always have the ideal wheel. We often find a wheel that retains the dull grains longer

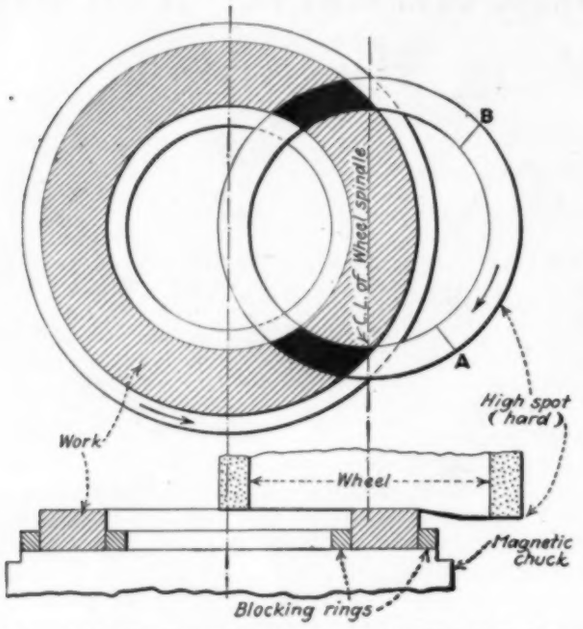


FIG. 3—AREA OF CONTACT BETWEEN WORK AND WHEEL WITH TRUE FACE

than is best and therefore an artificial method is supplied, to be used at the discretion of the operator, to make the grinding wheel better in its performance.

There are several methods of dressing the hollow-cylinder wheels used on the type of machine in question. A device that is interesting, particularly from a production point of view, is the wheel dresser illustrated in Figs. 1 and 2, which dresses the wheel while metal is being removed from the work. It consists of a bronze spindle, adjustable vertically, and mounted on the wheel head of the machine. The operating lever is at the upper end of the spindle and the lower end carries on an arm a set of Huntington dressing disks, which move across the face of the wheel at a point always clear of work and chuck.

Another method of dressing the wheels is to move the chuck and work clear of the wheel and draw across the face of the wheel a Huntington dresser, a hard carborundum stick or an old file held in the hand. When using this method the hand must be so held that if the dresser catches it will throw the hand away from and not toward the wheel edge.

It was mentioned that the increased strain on an abrasive grain should tear it from the wheel when it becomes dull. The statement might have been added that a sharp grain forced too far into the work will also be torn from the wheel, for with a given abrasive and bond there is a limit to the size of chip that each grain can take (governed by the hardness and tensile strength of the work) and when this size is exceeded the bond "lets go" the grain. The size of the chip is varied by the pressure per grain between the wheel and work, and since in the face of the wheel the grains per square inch are constant, the depth or size of chips taken by any grain in the wheel-face will vary with the pressure per square inch between wheel and work.

If a wheel with a true face were cutting on the work, the area of contact between wheel and work would be quite large. The total pressure between the wheel and work may be any amount up to the weight of the wheel head, and the pressure per square inch would be the total pressure divided by the area of contact.

Referring to Fig. 3, the cylinder wheel is supported on a vertical spindle, held in a very heavy wheel-head. This wheel head is supported by a feed screw and slides in vertical ways. The shaded area indicates the area of contact. The same figure shows a high spot revolving toward, but not in contact with the work.

In Fig. 4 is shown what happens when the wheel has revolved to bring the high spot into contact with the work. The upward thrust is taken through a ball-race to the wheel-head casting and the total pressure of grinding is taken on the small shaded area. The pressure per square inch is increased greatly. The area of contact may change from 15 or 20 square inches to $\frac{1}{2}$ or $\frac{1}{4}$ square inch, resulting in a tremendous increase in pressure per square inch upon the high spot in the wheel. The abrasive grains are forced so deep into the work that they are torn from the wheel face.

In this manner the hollow-cylinder wheel on a high-powered, rigid and heavy vertical spindle surface grinding machine trues itself, and mechanical truing is likely to make trouble. If the wheel is a little hard, too slow a speed of the diamond or truing device will create what is virtually a glazed wheel. The cylindrical wheel, whether used for cylindrical or flat-surface grinding, does not true itself in this manner, for eccentricity of the wheel face merely causes a slight increase in con-

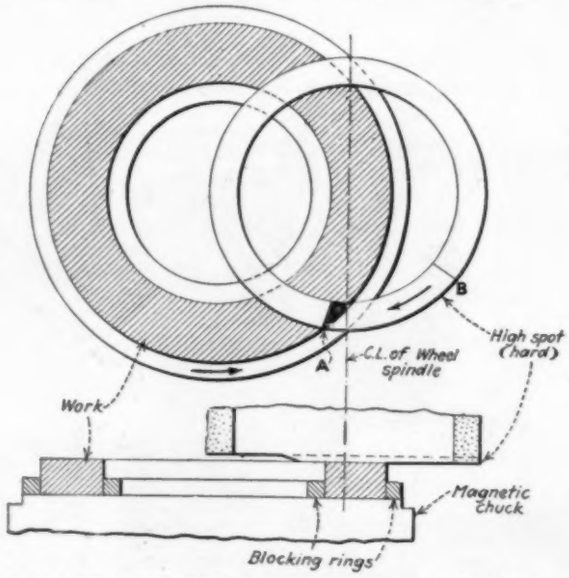


FIG. 4—AREA OF CONTACT BETWEEN WORK AND HIGH SPOT IN WHEEL

tact pressure, due to the spring of machine or work, which is not great enough to dress off the high spot.

If a wheel out-of-true were placed on the machine with partly finished work on the chuck, the work having only 0.002 or 0.003 in. to be removed, a good finish might not be obtained, due to the irregular depth of cut by different parts of the wheel face as the wheel trued itself. Truing the wheel mechanically would enable a good finish to be obtained.

Controlling Costs in Building Experimental Machines

By FRED H. COLVIN
Editor, *American Machinist*

The second article showing how tools were decided upon—How operation times were set—A system of low-cost pictorial drawings

MR. GEHRING knew the elements entering into the machine, and also the approximate price he could sell it for. With this information available, a cost price was arbitrarily set on each of the units shown in the table. On some of these which varied essentially from the unit of the first machine, the price was set even before the new units were designed. As soon as a layout was completed, penciled details were made on thin paper which allowed blueprinting. Without waiting for the completion of the details, as soon as a blueprint was ready it was referred to the designer and production man. Tentative suggestions were made as to special tools considered necessary to produce the parts in the small lots needed. Cost estimates were given by the tool designer.

The production man would then write a production sheet and list all the tools which, in his opinion, would be required for the job. Between the tool designer and the production man, very few blueprints were left untouched. The production man usually asked for simplification of design and for larger limits. The tool designer's requests were mostly for changes in shape which would allow simplification of tools.

Checking the Details

After a detail had passed the test of these two men, and if the estimated price of the parts did not seem too high, the print was O. K.'d and returned to the Engineering Department to be used in assembly drawing. In many cases, the first design had to be scrapped entirely, due to the fact that it would require too expensive tooling, or because it could not be made in the shop with existing facilities. When this blueprint was finally returned to the shop, tools were designed and cost estimated. The two foremen had the privilege of asking for more than the estimated time, and making such suggestions as to the modification of design as would reduce cost or give a better product.

In other words, while the tool and production men were in a way supervising the work of the engineering department from a manufacturing standpoint, the head of the tool manufacturing department was made responsible for the proper working of the tools, of which he had received drawings from the tool designer. He had the privilege of stopping work on a tool if, in his opinion, the tool would not do the work. Once he accepted a design, it was up to him to make it work.

After the tools were completed and the standard tools secured, the part was given to one of the few highly skilled mechanics, and either a sample or a small lot produced. Here again, the advice and opinion of these practical men were sought. In many cases, the time consumed in making the parts was so great that it was necessary to re-write the original operation sheet, to change the tooling and, in some cases, to modify the

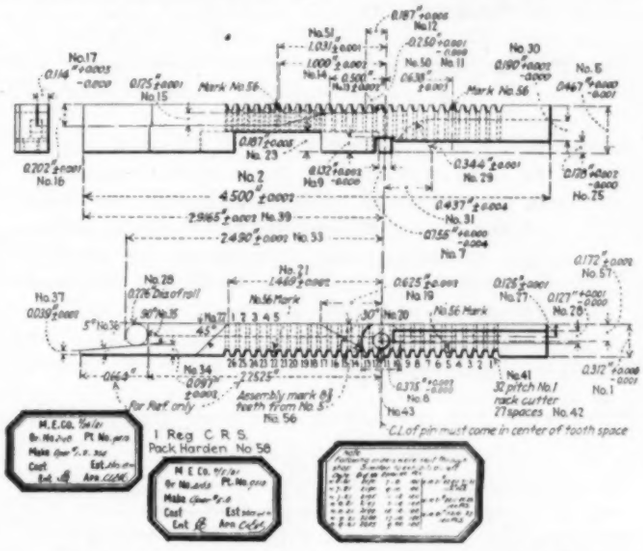


FIG. 3—PRODUCTION ORDER WITH STICKERS

design. As soon as the pieces were made in an experimental way, inspection sheets which were written at the same time as the operation sheet, were properly revised. In some instances a second revision of the instructions for inspection had to be made at the time of assembly. The next step was to decide a system of planning and manufacturing of parts, of keeping blueprint reference files, of establishing a system of assembly with proper stock room facilities, and of establishing a system of inspection.

While many parts which go to make up the machine are duplicated many times, some occur only once, making an output of only 45 pieces per year on a basis of nine complete machines. This made it necessary to exercise considerable care in considering methods. It was almost invariably found that if a part was put into the shop without preliminary study, it took more time to collect tools, to secure the stock and set up the machine than to actually manufacture the parts.

Part Name STRIPPING RACK — No. Pcs. Per Conveyor 80 — Part No. 9513

Written by E.A.K. — Approved by ACB — Operation Sheet — Date Order 3-26-21 — Date Finish 4-5-21 — No. Pcs. Order 100 — P. O. No. 2142

No.	Operation	Mach. to Be Used	To Be Filled In By Shop: Mach. Used	No. of Pcs Made	No. of Pcs Spoil	No. of Pcs Short	Clock No.	Estimate In Lot of 100 Pcs. Setup: Per Lot P S	Setup: Per Pc. P S	Mach.: Per Lot P S	Mach.: Per Pc. P S	Total: Per Lot P S	Total: Per Pc. P S	Actual Shop Time in Lots of 100 Setup: Per Lot	Setup: Per Pc.	Mach.: Per Lot	Mach.: Per Pc.	Total: Per Lot	Total: Per Pc.
								P S	P S	P S	P S	P S	P S						
11	Profile Segment Clearance	Profiler	✓	100	✓	✓	904	:15		1:40		NRS 1:55	MIN.	:10		2:00		NRS.	MIN.
12	Burr	Bench	✓	100	✓	✓	904	✓	✓	:25		:25	M 1.4	✓	✓	:20		2.30	1.5M
13	Mill Pawl Clearance	Hor. Miller	✓	100	✓	✓	944	:30		1:30		2:00		:35		1:45	M 1.05		
14	Burr	Disc Grinder	✓	100	✓	✓	944	✓	✓	:15		:15	M 1.35	✓	✓	:10		2:30	1.5M
15	Mill Slot For Cam Slide	Bench Miller	✓	100	✓	✓	913	:30		1:15		1.45		:30	✓	1:15			
16	Burr	Bench	✓	100	✓	✓	913	✓	✓	:25		:25	M 1.3	✓	✓	:15		2:00	1.2M
17	Mill 5° Angle	Hor. Miller	✓	100	✓	✓	944	30		1:40		2:10		:40		2:05			
18	Burr	Bench	✓	100	✓	✓	944	✓	✓	:25		:25	M 1.35	✓	✓	:15		3:00	1.8M
19	Cut Teeth of 3/32 Tool Steel Face	Lincoln Miller	✓	100	✓	✓	913	:20		1:40		2:00		:25		1:25			
20	Burr	Disc Grinder		100	✓	✓	913	✓	✓	:10		:10	M 1.3			:10		2:00	1.2M
		Totals																	

Foreman's Appvl. E.S.G. — Approved by Prod. Dept. ACB

No.	Changed By	Appvd. By	Explanation of Additional Time Asked For:
17	E.S.G.	ACB	Estimated to Low
11	E.S.G.	ACB	Broken Cutter

No.	Changed By	Appvd. By	Change In Operation:

Explanation of Shortage or Spoilage:

FIG. 4—PART OF OPERATION SHEET

Consequently, it was decided to group all similar parts together, so as to manufacture them at the same time. Lathe work was practically eliminated, as it was found cheaper to make even small lots on hand screw machines.

Under this grouping plan, all parts of the machine had been indexed according to the similarity of manufacture, of material, of tooling and size. As an illustration, all spiral springs made of 0.020 in. wire are ordered at the same time. In the same way, shafts of the same size, screws, shoulder studs and other similar pieces are ordered together. They also go a step further and re-group screw machine parts which require a second operation, in accordance with the work to be done. Sections of three of the sheets showing the classification of material are shown in Fig. 3. These give a rough sketch of the piece, as well as its size. Classifying by size in this way makes it easy to so group the work that a number of small lots of

Name of Part STRIPPING RACK — Per Con. 80 — Part No. 9513

Tool and Material Sheet — Date Order — Date Finish — Pcs. Order — Pcs. Req. — Pcs. Finish — P. O. No.

Oper.	Quan. Req.	Quan. Stan. Spec.	Standard Tools	Substitute If Any	Reg. or Sub.	Stock or Req.	Date	Rec'd	Date
2	4		3/32 x 6" Milling Saws						
2	1		1" x 21" B&S Taper Mill Arbor						
2	2		5/16 x 2" Planer Bolts						
4	1		Straight Edge						
5	1		4 x 3/4 Slab Mill Cutter						
5	1		1" x 10" B&S Taper Mill Arbor						
5	1		6" B&S Vise						
5	2		5/16 x 2" Planer Bolts						
5	2		1/4" Parallel						
9	1		1/2" End Mill						
9	1		7/8" to 9 B&S Taper Sleeve						
9	2		5/16 x 2 Planer Bolts						
10	1		Hand Scraping Tool						
11	1		3/4" End Mill						
11	1		7/8 to 9 B&S Taper Sleeve						
11	2		5/16 x 2 Planer Bolts						
12	1		Hand Scraping Tool						
13	1		3" x 2" Slab Mill Cutter						
13	1		1" x 10" B&S Taper Mill Arbor						

Oper.	Name of Special Tools	Tool No.	In Stock	To Be Rep.	Date
1	Gauge	T-9442-A	Yes	No	
2	Spacing Collars	T-9441-A	Yes	No	
2	Cut of Fixture	67-89	Yes	No	
2	Gauge	T-9442-A	Yes	No	
5	Gauge	T-9442-A	Yes	No	
7	Hollow Mill Fixture	T-9510-A	Yes	No	
7	Hollow Mill	T-9510-A	Yes	No	
7	Gauge	T-9510-B	Yes	No	
9	Profile Fixture With Pin	T-9510	Yes	No	
9	Gauge	T-9513-A	Yes	No	
9	Gauge	T-9511-A	Yes	No	
11	Profile Fixture With Pin	T-9510	Yes	No	
11	Gauge	T-9511-A	Yes	No	
11	Gauge	T-9513-A	Yes	No	
13	Mill Fixture	T-9510-C	Yes	No	
13	Gauge	T-9510-A	Yes	No	
15	Mill Fixture	T-9510-C	Yes	No	
15	Mill Cutter	T-9510-C	Yes	No	
15	Gauge	T-9510-B	Yes	No	
17	Vise Jaws	T-9510-B	Yes	No	
17	.226 Dia Roll	T-9510-B-A	Yes	No	
17	Gauge	T-9510-B-A	Yes	No	

Material — Best Substitute

Kind	Size	Quan. Lot of 100	Kind	Size	Quan. Lot of	Reg. or Sub.	Stock or Req.	Date	Rec'd	Date	O.K. By	Date
C.R.S.	5/16 x 1/2	22 LBS.										

FIG. 5—TOOL AND MATERIAL SHEET

Inspection Sheet P. O. No. 2142 Part No. 9513

Shop Inspection													Inspection Dept.										
Material				Foreman				Tools		Inspector			Inspected			Rejected			To Be Repair.			To Be Scrap.		
Size Ch. By	Date	No. Pc. Cut	Ch. By	No. Pc.	Oper. No.	Ch. By	Date	Ch. By	Date	No. Pcs.	Ch. By	Date	No. Pcs.	Ch. By	Date	No. Pcs.	Ch. By	Date	No. Pcs.	Ch. By	Date	No. Pcs.	Ch. By	Date
H.	3/27/21	22 LBS	H.	22 LBS	1	G.S.B.	3/27/21																
H.	3/27/21	100	H.	25	2	G.S.B.	3/27/21	B.W.	3/26														
H.	3/27/21	100	H.	25	3	G.S.B.	3/27/21																
H.	3/27/21	100	H.	100	4	G.S.B.	3/27/21	B.W.	3/26	100	B.W.	3/28				0	B.W.	3/28					

Inspector's Report

What to Inspect	Report	What to Inspect	Report	What to Inspect	Report	What to Inspect	Report
#1-3/12 +.000 -.001 CAN BE 3/12 +.001 -.002	OK						
#1-½" " " STOCK	OK						
#2-4.500 +.002 " 4.500 +.005	OK						
#3-MUST HAVE NO BURRS	OK						
#4-MUST BE STRAIGHT	OK						

FIG. 6—INSPECTION SHEET

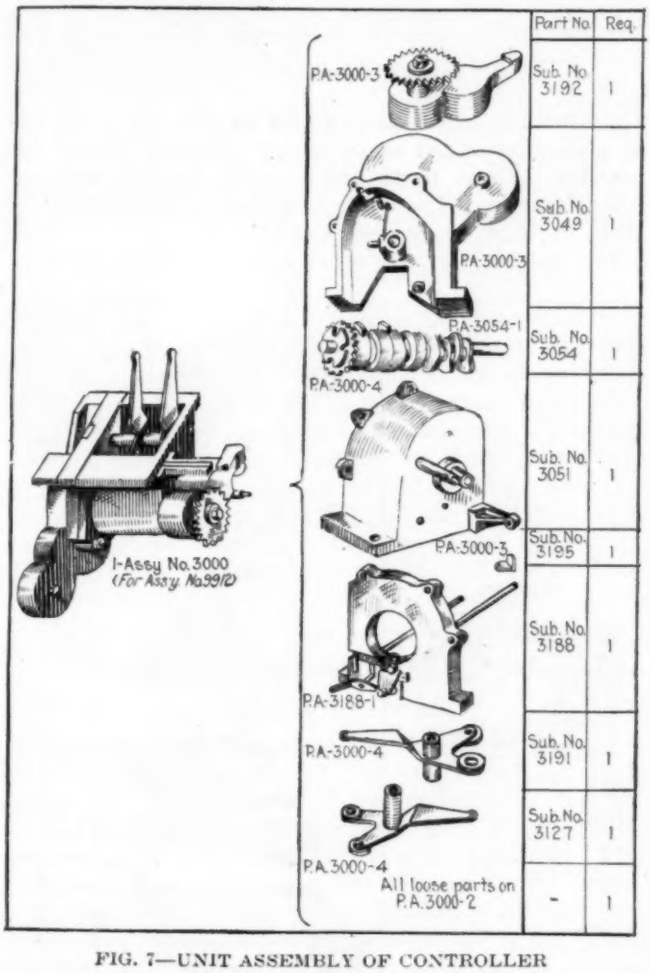


FIG. 7—UNIT ASSEMBLY OF CONTROLLER

similar size can be run through with very little change in the machine. In keyseating, for example, it is possible to group several different sizes of pieces and cut the pieces on one order.

When a piece is ready to go into the shop, the foreman receives a blueprint with a sticker, as in Fig. 3, showing a production order and the total estimated time he has accepted for the job. He also gets an operation sheet, part of which is shown in Fig. 4, a tool sheet Fig. 5, listing all the tools needed, and an inspection sheet, Fig. 6. In order to save time, the stock and all tools, both standard and special, are collected and brought to him at the same time as the blueprint. Should he exceed his estimated time, he is advised by the time clerk while the job is in progress, so that he can locate the trouble and explain the reason for the delay. The inspection department has a separate set of inspection sheets, showing maximum tolerances allowed, these in most cases being larger than those given on the manufacturing print.

Pictorial Assemblies

One portion of Mr. Gehring's system which appeals especially to shop men is the use of "PA" sheets, the initials standing for photographic assemblies. In reality, it is not photographic, but pictorial, the pictures being sketches in perspective, which show the design of the piece, so that there can be no mistake as to what it looks like This is particularly useful when it comes to assembly wark. An example is given in Fig. 7, which shows a unit for the control. As can be seen at a glance, this consists of seven sub-assemblies, one of each being required for the complete unit. Each sub-assembly is numbered, and full details of it can be found under that number.

Taking the upper sub-assembly, part 3192, we find details of this in Fig. 8. Each part is numbered, and this also includes two minor sub-assemblies, Nos. 3193 and 3194, both of which are shown in Fig. 9. The parts which go to make them up are shown by num-

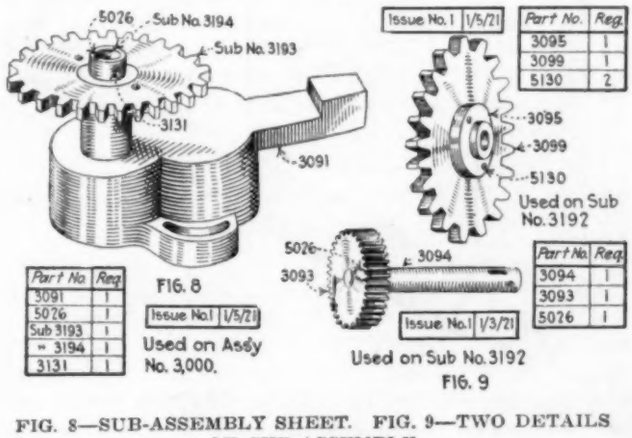


FIG. 8—SUB-ASSEMBLY SHEET. FIG. 9—TWO DETAILS OF SUB-ASSEMBLY

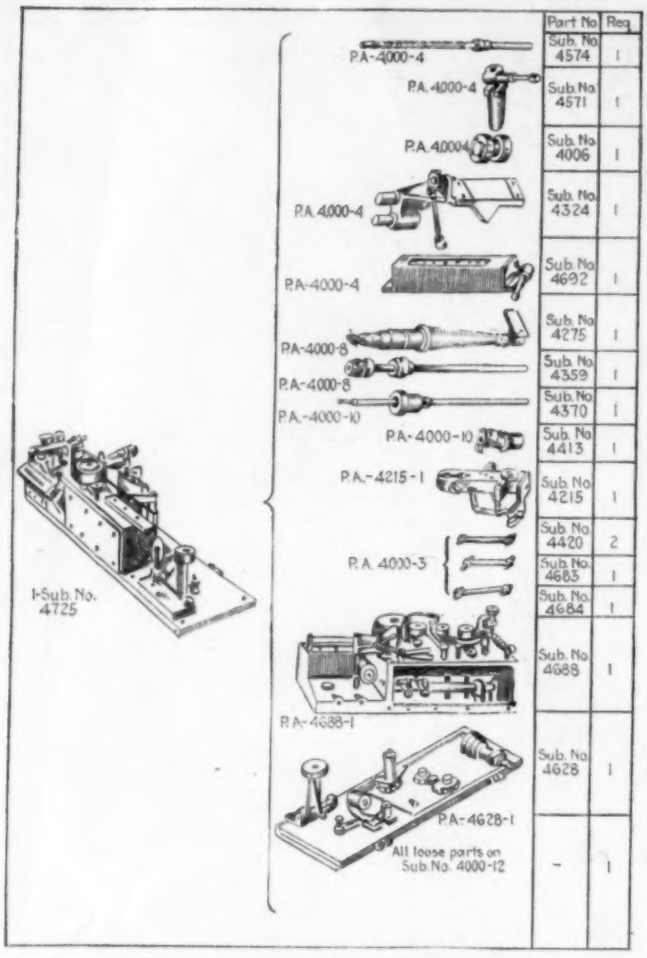


FIG. 10—UNIT ASSEMBLY OF SEPARATOR

bers. An example of a more complicated assembly sheet is shown in Fig. 10. The unit, called the separator, is shown at the left. It is made up of 15 sub-assemblies. Only one of each is required, except sub-assembly 4420, of which two are needed.

One of these sub-assemblies, No. 4275, is shown in Fig. 11. This contains all the sections for assembly. Fig. 12 shows several sub-assemblies, and the way in which they are made up. The complete sub-assembly is shown roughly at the left, number 4275. At the

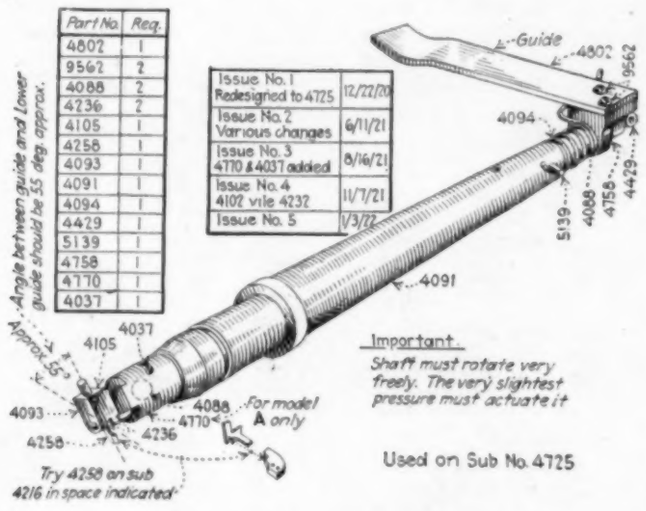


FIG. 11—SUB-ASSEMBLY OF ONE PART

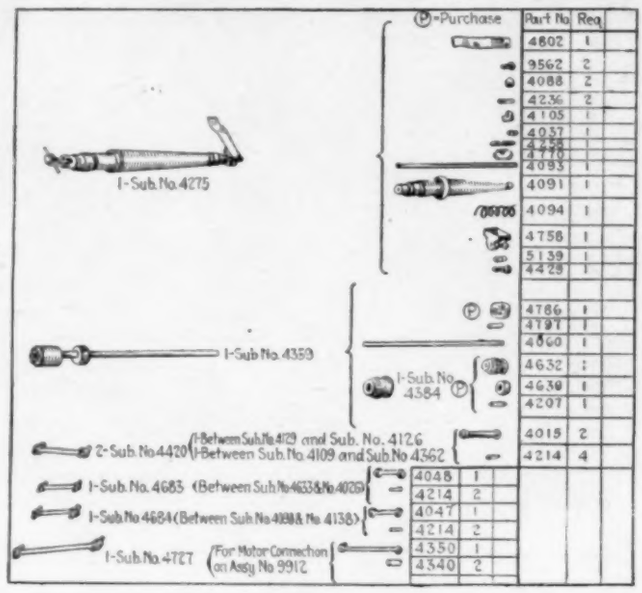


FIG. 12—DETAILS OF SUB-ASSEMBLY

right is a list of the parts which go to make it up, and so plainly arranged as to render mistakes almost impossible. These parts are grouped for the different sub-assemblies. There are 14 different kinds of pieces, three of them being used twice.

In a similar way, the other parts are shown in their

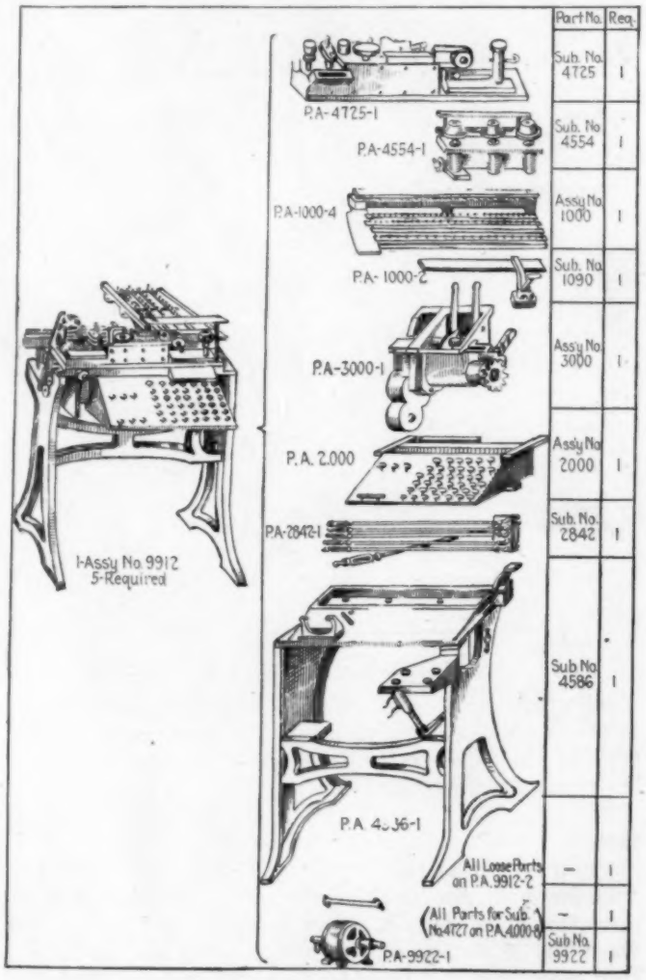


FIG. 13—COMPLETE ASSEMBLY OF SEPARATOR

respective groups. Sub-assembly No. 4359, for example, is made up of another sub-assembly, No. 4384, consisting of the three parts shown. This assembled group is then put on the end of shaft No. 4060 and the roller, No. 4786, is fastened in position by the pin No. 4797. The general assembly is shown in Fig. 13, consisting of numerous sub-assemblies. The complete unit is the separator assembly No. 9912, of which five are required for each machine. One of the sub-assemblies, No. 3000, was shown in detail in Figs. 7, 8 and 9.

Carrying this still further, the completed machine is

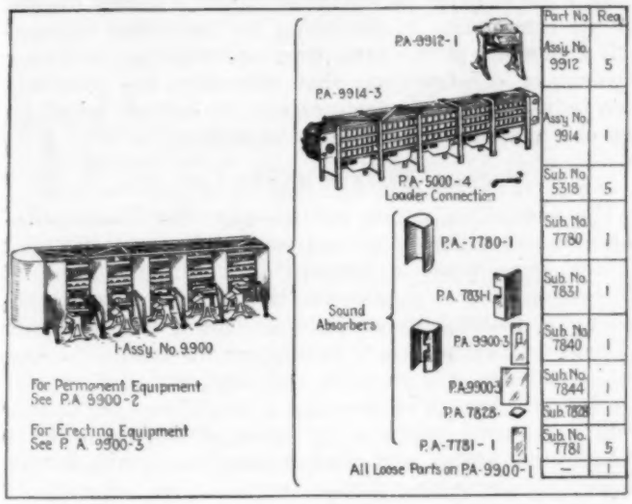


FIG. 14—ASSEMBLY SHEET OF COMPLETE MACHINE

shown at the left, in Fig. 14, with the five separator units in position. As indicated by the grouping at the right, the completed machine consists of five separators, No. 9912, a carrying unit, five loader connections, and a number of sound absorbers. Such assembly drawings as this leave little room for error and make it possible for mechanics to assemble it without diffculty, even if they are not especially familiar with the machine. The use of pictorial blueprints such as these has many advantages, particularly in training new men. The final article will follow.

Pessimist-Rationalist-Optimist

BY CHARLES H. NORTON

In the *American Machinist* there appeared two very interesting letters under the title of "Personality and Pessimism," one by Charles W. Lee on page 967, Vol. 57 and the other by John C. Spence on page 254, Vol. 58.

There seems to be some doubt in the minds of both writers as to whether they are rationalists or pessimists. Mr. Lee no doubt is a rationalist as he suggests for we find the definition of rationalism to be, "The formation of opinions by relying upon reason alone, *independently of authority or revelation.*" I would suggest to this writer that the designer who is visionary may sometimes have real constructive help from some optimist, and that this relation of a visionary and helpful optimist may result in a reveiation that may prove embarrassing to the rationalist. Such cases have happened frequently in mechanical history.

There seems to be little doubt from Mr. Spence's letter that he is a pessimist, for we read in our dictionary that pessimism is "A disposition to take a gloomy view of affairs." His own definition of a pessimist is, "Simply a person that history proves was right." I would call attention to the fact that history of our day is still in the making and not complete. When it is complete Mr. Spence's definition may require revision. We humans so often forget the dangers of the distant future in our present victories.

Mr. Spence quotes a line from Pope's essay on man, "Hope ever present in the human breast." The first line of that poem reads, "Heaven from all creatures hides the book of fate," and on another occasion the same poet wrote,

"Oh! thoughtless mortals ever blind to fate,
Too soon dejected and too soon elate,
Sudden these honors shall be snatched away,
And curs'd forever this victorious day."

What Is a Profit?—Discussion

BY ENTROPY

Harry Senior comes back on page 193, Vol. 58 of the *American Machinist* and takes me to task for failure to make myself clear as to what I mean by "Greatest Profit." These words have only one meaning to a bookkeeper, but to a man in business they may mean a great many more things than are mentioned in books on accounting or even in the dictionary.

What I meant, and I thought it was fairly clear, was that a man might secure co-operation of the most intense kind and yet not make either the maximum present profit as measured by the bookkeeper, or by future's gain. For example, the man of whom I wrote was a man who secured co-operation by making himself the hero of the organization in the minds of his employees. The chances of a man getting into such a position and yet surrounding himself with truly able men are very few. Men of high caliber are usually without illusions as to their own or others capacities, or so I have found, at any rate.

Again, the man who is able to secure such complete co-operation that he is looked to as a hero, usually gets so conceited as to be unable to take or recognize good advice. It is harmful to him, it makes him cock-sure and it also makes him a back number long before his time. The man who accomplishes the most keeps enough men around him who do not think highly of him to at least keep him from rusting out. A certain amount of fighting is good for anyone. When things are coming our way easily, we get careless, we let economies go by for want of observation, we fail to make improvements, we grow fat physically and mentally.

Temperance is a good thing. Too much of a good thing is just as intemperate as too little. Let's try to be temperate in co-operation as well as in other things. If we are not, why, by and by there will be a constitutional amendment prohibiting us from co-operating at all.

Production of Steam, Gas and Water Engines 1921 Census

The extent of the increase in the manufacture of steam, gas and water engines for the period from 1914 to 1921 is 176.6 per cent. As was to be expected, the value of the products decreased when compared to the year 1919. This decrease amounted to about 57 per cent. There were 296 establishments reporting products value at $5,000 or more in 1921.

Recommendations of Special Committee of the President's Conference on Unemployment

THE SPECIAL committee on unemployment resulting from the depression in the business cycle, appointed by Secretary Hoover, as Chairman of the President's Conference on Unemployment, made public Monday the conclusions reached after more than a year's study.

The committee comprised: Owen D. Young, President of the General Electric Co., as Chairman; Joseph H. Defrees, formerly President of the U. S. Chamber of Commerce; Mary Van Kleek, of the Russell Sage Foundation; Matthew Woll, Vice-President of the American Federation of Labor; Clarence M. Woolley, Chairman of the American Radiator Co.; and Edward E. Hunt, Secretary.

The committee enlisted the services of more than 200 employers, labor leaders, economic experts, financial advisors, and social workers. It was requested by Secretary Hoover that they make an exhaustive investigation into the facts and causes of periodic business depression—hard times—and see if suggestions could be made of remedial steps that might be taken by the business community to avoid such interruptions to prosperity and employment.

The committee has now issued its own summary of conclusions and suggestions. This will be followed at an early date with the complete publication of the facts and material collected.

The committee analyzes the various economic phenomena of the periodic business boom and sequent depression, and its conclusions are that preventive measures must lie in the better handling of business in boom times because depressions are due to over-expansion, inflation, loss of efficiency, waste, and extravagance in the boom periods; that therefore the first point of attack on the problem must be more informed action by individual business men in periods of rising markets in order that excessive expansion may be prevented and the extent of the decline reduced. Stress is laid upon the necessity of better understanding of the business cycle by the business executives generally. The suggestions for control of excessive expansion embraces recommendations as to the control of credit by individual banks, possible control of inflation by the Federal Reserve System, the control by individual business men of expansion in their own business, and the retardation in boom times of government and large utility building and construction.

Expanding Employment Bureaus

The methods of reducing the extent of the decline lie in the building up of governmental and public utility construction in times of depression, the use of unemployment funds, and the expansion of Federal, State, and farm employment bureaus. The better control of credit against over-expansion and speculation through individual banks and the guidance of business itself by danger signals of over-expansion are fundamental.

The committee considers that before the banks, business men, and others can take constructive action in the enlightened conduct of business in this relation, there must be recruited and constantly disseminated the fundamental information on which the trends in business can be properly adjudged by each individual business man, and it strongly recommends the recruiting of enlarged and more systematic statistical information by the Department of Commerce and its wider dissemination.

The committee calls attention to the fact that the ebb and flow in demand for consumable goods is less controllable than that of construction of buildings and equipment both governmental and private; that the tendencies of boom periods is to thrust a double burden on the community of providing for increased consumable goods and at the same time undertaking the larger burdens of construction; that therefore, the construction industries are to some extent the balance wheel on the ebb and flow of boom and depression.

Federal Reserve Banks Can Aid

The committee points out the part the Federal Reserve Banks can play in restriction of speculation and at the same time in liberalizing credit in times of depression, and it points out that at the present moment the Federal Reserve Banks hold a larger supply of gold than is necessary to support the credit machinery of American commerce and suggests that consideration be given to earmarking a special reserve of this gold as against probable future gold shipments from the United States and thus accomplishing the double object of preventing both temptation to inflation of credits on the basis of this surplus gold supply and at the same time the great embarrassment of possible financial credit difficulties that would arise if foreign drafts were made upon the gold which had been used as a credit basis.

A questionnaire is proposed to business men, bankers, managers of public utilities, wage earners, and public organizations with a view to stimulating organized consideration and inquiry.

The Carnegie Foundation made appropriations toward meeting the cost of the inquiry. The National Bureau of Economic Research, The Russell Sage Foundation, the Federated American Engineering Societies, the United States Chamber of Commerce, the American Federation of Labor, the American Statistical Association, the American Economic Association, the Bureau of Railway Economics, and the Department of Commerce were among the bodies which contributed services. The vast compilation of fact and opinion on which the committee based its conclusions was effected under the direction of the National Bureau of Economic Research, whose director is Wesley C. Mitchell.

Secretary Hoover, in a foreword to the report, says:

"I am confident that it represents a definite advance in economic thought and offers practical, constructive suggestions that should make for progress.

"The report does not suggest panaceas or economic revolution but seeks to drive home the facts that the enlargement of judgment in individual business men as to the trend of business and consequent widened vision as to approaching dangers will greatly contribute to stability, and that the necessary information upon which such judgments can be based must be systematically recruited and distributed."

The report and recommendations are published in a 6x9-in. pamphlet, that may be secured for 5c. from the Superintendent of Documents, Government Printing Office, Washington, D. C.

A Set of Progressive Operation Press Tools

BY FRED E. JOHNSON

A multiple operation tool—Dies made in two sections—Piercing, slitting, first and second forming—Stock feeds from coil—Press runs continuously

THE SET OF progressive operation tools described in this article was designed for the quantity production of small sheet metal clips, shown in Fig. 1, for use in connection with a patented lock-nut for the purpose of holding loose keys in place during shipment and while applying the nuts. Though the tools may appear in the description to be somewhat more elaborate in construction than the simple nature of the product would seem to warrant, they were not so in fact for the reason that the clips were required in very large quantities and the tools were expected to run continuously without attention.

The stock was supplied in strip form, sheared to width and fed from the coil by means of a roll-feed from which the regular ratchet had been removed and a friction disk substituted in order to secure exact length of feed with very minute adjustment. There were four stages, or operations, namely: piercing, slitting, and first and second forming.

The dies, as shown in Fig. 2, are made up in two separate sections. The first block, *A*, has a slot $\frac{3}{4}$ in. wide and deep planed lengthwise through it, in which the dies *B*, *C*, *D* and *E* are held by setscrews from the side. This slot also carries the part *F*, which acts merely as a filler. There is also a crosswise slot $\frac{3}{16}$ in. wide in block *A*, in which is inserted the blade *G* to form one side of the square hole. The slitting die *C* slits the metal to permit the side arms and the curved central portion of the work to be formed.

The die *D* is for partially forming the center portion, and the two dies *E* partially form the arms. The cut-off blade *H* parts the stock. A bridge *I* guides the stock centrally through the dies. All of these parts are a light drive fit in the $\frac{3}{4}$-in. slot.

The punch holder is slotted and the two pieces *J* and *K* are used to hold the punches. Punches *L*, *M* and *N*, and the cam *O*, are held by friction only. The two parts *J* and *K* were milled as one piece and were then

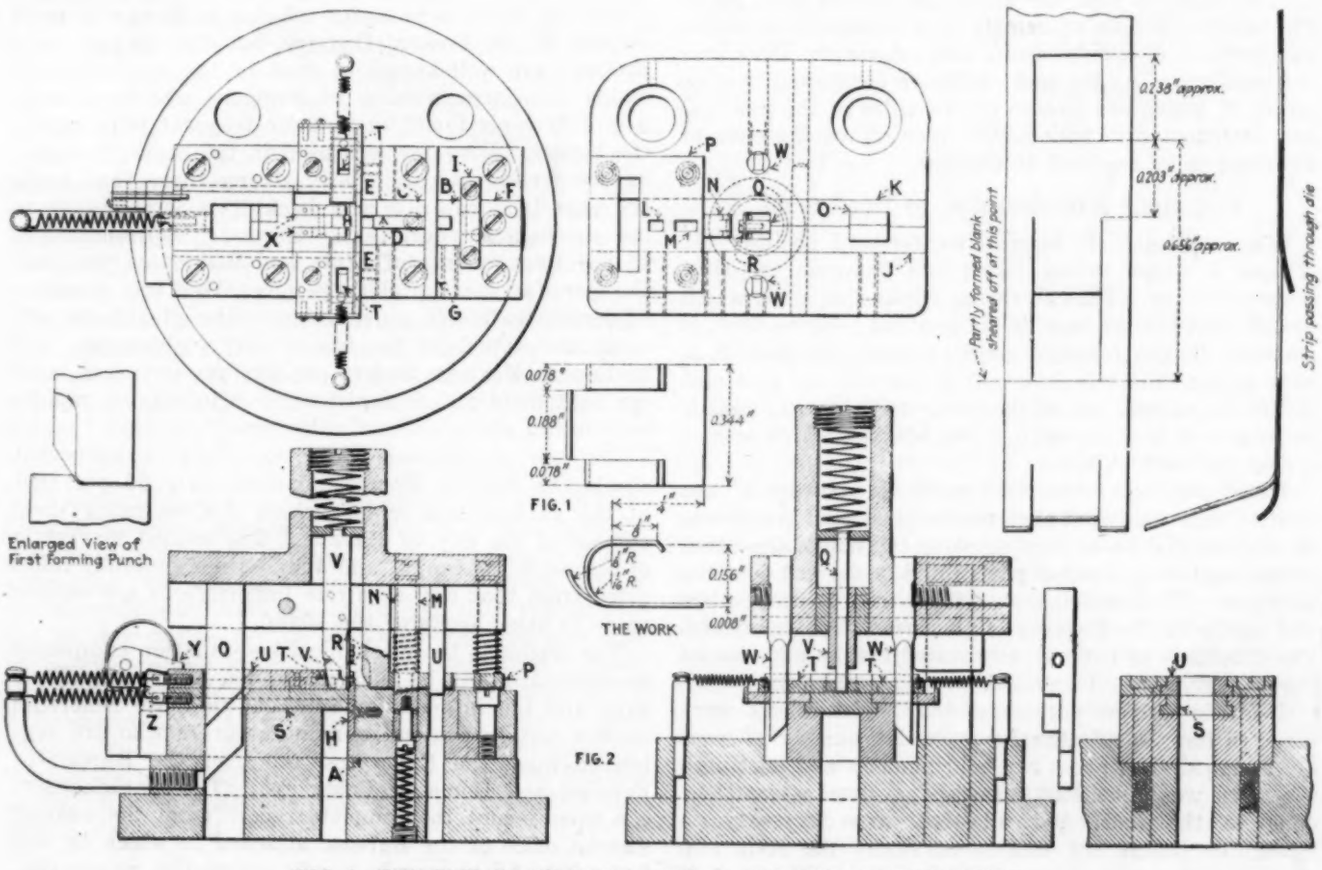


FIG. 1—THE CLIP TO BE MADE. FIG. 2—DRAWING OF THE TOOLS

divided lengthwise by a slitting saw in order to insure perfect matching of the two parts. The punches are a light drive fit in their respective places and the assembled parts as a whole are fitted to the slot in the punch holder, where they are held against endwise movement by a ¼-in. dowel assisted by setscrews opposite the punches *L* and *N* and the cam *O* for further security.

A spring stripper *P* strips the stock from punches *L* and *M*. The punch *Q* carries the cut-off blade *R* that cuts off the partly formed blank against the lower blade *H* and holds it in position on slide *S* while the other slides are operating. The cutting off is done by the spring in the shank, which is sufficiently strong for this purpose. After cutting off the blank the punch *Q* travels up the shank during the remainder of the down stroke of the press.

The Final Forming Operation

The slides *T* and *U* and the punches *V* perform the final operations. The action is as follows: The feed rolls are raised and the strip of stock fed in by hand under the bridge *I* until it is over the piercing die *B*, when the press is tripped and the square hole pierced. The movement of the press then carries the stock forward to second position where it is slit by the punch *N* and die *C*. On the next stroke the stock reaches third position where the end of the central portion is cut off and the arms partly formed.

The next movement brings the stock under the punch *Q* where, upon the down stroke of the ram, the slide *S* is brought forward by the first portion of the cam *O* to support it. When the slide is in position the shear on punch *Q* shears the stock and holds the blank in place. The two cams *W* then bring the mandrels on slides *T* into position so that the arms are formed over them. The second portion of cam *O* then brings forward the two formers *X* upon slide *U*, which form the arms over the mandrels. As the ram continues downward the two pieces *V*, which are located on the sides of the punch *Q* and fastened to it with rivets, form down the ends of the arms to an angle of 45 degrees.

Ingenious Arrangement to Hold Slide

When the slide *U* reaches its forward position the trigger *Y* drops into a notch and prevents the slide from returning. Thus on the up stroke this slide, which would otherwise go back to its original position first, is retained in the forward position until the slide *S* is back against the trigger at *Z*, acting thereon as a cam to lift the trigger out of the notch and allowing slide *U* to snap back to place against the bracket, which acts as a stop for both slides.

When the tools were first made the trigger *Y* was omitted, but we found that the finished part was liable to stick to and be carried up with the punch *Q* so that on the next cycle another part would be formed over the first one. This sticking was due partly to magnetism and partly to the forming of the arms slightly inward. The trouble was entirely eliminated by the addition of the trigger, as the formers *X* acted as strippers.

This die was so successful that eight others were made to the same design for a similar number of sizes of the clips. The press ran continuously and, although the stock would sometimes buckle, no damage would be done to the tools and all that was necessary to straighten things out was to cut away the strip and start it over again.

Service Station Equipment Needed in Foreign Countries

Modern automotive service station equipment, such as is used in nearly every garage and service station in the United States, is needed in almost every part of the world, with the possible exception of European countries where domestic manufacturers have taken better care of requirements. The rapid increase in the use of passenger cars and trucks all over the world within the last few years has caused considerable competition between foreign distributors and dealers, and this combined with the necessity of giving better service is creating a demand for the best and most modern service station equipment, according to M. H. Hoepli, Acting Chief of the Automotive Division of the Bureau of Foreign and Domestic Commerce.

The Automotive Division has already started its survey on the particular needs in each country and the returns are now coming in from its recent questionnaire on the markets for mechanical tire inflation equipment. Although these have only been received from Canada, Mexico, and Cuba, a definite need for equipment has been found in these returns.

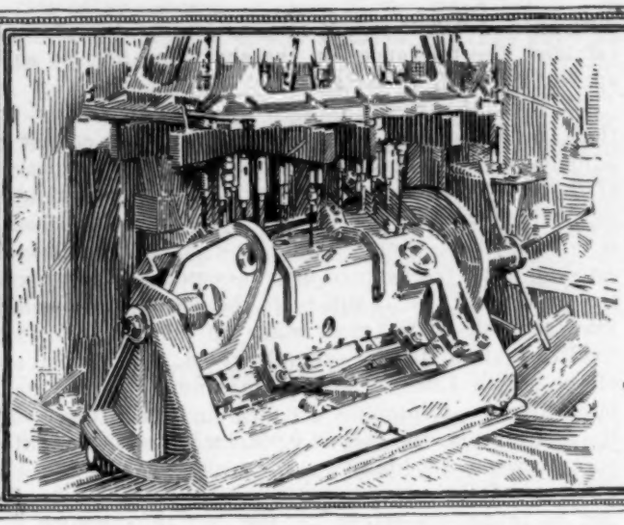
Canadian motor vehicle dealers desire to install any machinery which gives better service, and therefore air compressors are already in general use in proportion to the registrations in the various centers. Abundant electric power makes their operation cheap, and our manufacturers will find a market not only in supplying rural garages but in replacing out-of-date equipment as the dealers and garagemen find that free air brings increased sales of gasoline and oil.

Air Compressors in Mexico

The registration of motor vehicles in Mexico is small outside of the Federal District, but even so, air compressors are well known in most of the northern part owing to a large number of Mexicans who have made use of free air facilities in their frequent trips across the border. Very few are used in the south, however, as the feeling is particularly strong there that while the chauffeur has a strong back it is unnecessary to use mechanical equipment. However, representatives of the Departments of State and Commerce feel that the manufacturers' problem resolves itself into a matter of demonstration in order to prove the advantages and economics found in the use of air compressors. All up-to-date Mexican dealers are anxious to install modern equipment and as registration is increasing rapidly both initial and additional sales should increase.

The use of air compressors in Cuba is somewhat similar to that in Mexico, approximately 50 per cent of the garages and motor vehicle dealers using them outside of the city of Havana. The largest market is of course in the capital and distribution generally takes place from that city as direct importations are seldom made to other parts of the island.

The replies to the mechanical tire-inflation equipment questionnaire will be analyzed in the Automotive Division, and the information sent out to those American service station equipment manufacturers who are registered upon the Exporters' Index of the Bureau of Foreign and Domestic Commerce, The manufacturer can then secure the complete report from the nearest district office of the Bureau, attached to which he will find a list of jobbers who handle automotive accessories.



Tool Engineering

By

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Design of gages begun — Gaging in the manufacture of interchangeable parts— Meaning of allowance, tolerance and limit—Types of fits—Establishing tolerances

THE PRODUCTION of work on an interchangeable basis can be accomplished only by the use of jigs and fixtures of approved design in combination with a gaging system and gages having limits of suitable range for the work. We have discussed at length the design of jigs, fixtures, cutting tools of various kinds, punches and dies and devices of different kinds used for production purposes. We shall now take up the design of gages in much the same way, giving fundamental principles on which the science of gaging is based and using many diagrams and examples to illustrate the important points.

Before going into the actual design, it is well to say a few words regarding the purpose for which gages are used; and in order to explain this purpose a clear understanding must be obtained regarding interchangeable manufacture and the use of tolerances. Many people have an erroneous idea of the purpose of interchangeable manufacture, and consider that the manufacture of parts on the interchangeable system is principally to make pieces so that they can be used to replace similar pieces which have been badly worn or broken. Undoubtedly, this is an important item, but it is not by any means the principal reason. The *reduction of manufacturing costs* by means of interchangeable manufacture is the primary reason for its use. Any other idea is secondary and would not be considered if manufacturing costs were higher instead of lower.

Reason for Use of Gages

In analysing the matter of interchangeable manufacture, we must first consider that it is not humanly possible to manufacture a great number of parts of the same kind that will all be exactly alike. There will be slight variations here and there, yet these variations can be kept within certain limits, so that one part will fit another whose limits have also been fixed. From this statement, understanding can easily be reached of a fundamental point in interchangeable manufacture. That is, work cannot be held exactly to size in quantity manufacturing, but it can be held within well defined limits. For this purpose, gages of various kinds are used.

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In order to manufacture a given part in quantities and at the same time retain the important sizes so that the part will correctly fit one or more parts which are to be assembled with or adjacent to it, a determination must first be reached as to the kind of a fit which is necessary for the proper functioning of the units. For example, if a shaft is to revolve freely in a bearing there must be clearance between the two, and the

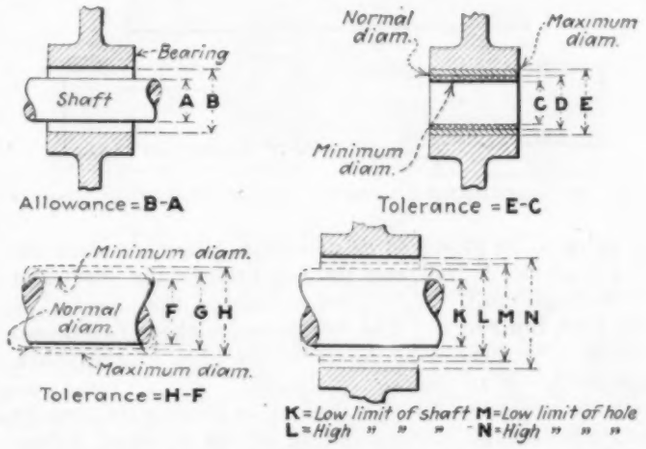


FIG. 519—CHART EXPLANATORY OF GAGING TERMS

amount of clearance must be sufficient for a film of oil or grease between the parts. Unless this provision is made, the mechanism will not function properly and an unsatisfactory product will be obtained. The first requirement, then, for successful manufacture on an interchangeable basis is proper allowance between the parts. After the allowances have been determined carefully, permissible variation must be decided upon; after which the tolerances and limits can be established.

To obtain a clear understanding of the limit system a thorough knowledge of terms used is essential. Many people use the terms allowance, tolerance and limit incorrectly due to a misunderstanding of their exact meanings.

Allowance is used to express the desired relation between *two* adjacent parts. For example, the clearance between a shaft and bearing is called the allowance. The term allowance cannot be applied to a single part,

as it means nothing in this connection. Fig. 519 shows a shaft having a diameter *A* and a hole or bearing indicated by the letter *B*. The allowance between these two parts would be indicated by *B*—*A*.

Tolerance is the total amount of variation permissible in manufacturing a certain part. The term is applied to one part only. The total amount of established variation over or under a given size is termed the tolerance. The hole shown in the drawing has a minimum diameter *C* and a maximum *E*. The tolerance would be indicated by *E*—*C*. The dimension *D* might be considered as the nominal size of the hole. In the example which shows the shaft, the minimum diameter is indicated at *F* and the maximum at *H*. The tolerance here would be determined by *H*—*F*. The mean diameter of the shaft or the nominal size is indicated at *G*.

Limit is applied to the maximum and minimum size

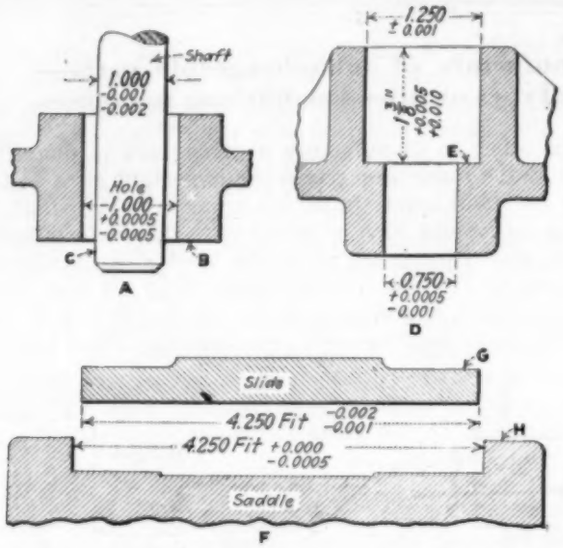


FIG. 520—DIAGRAMS SHOWING APPLICATIONS OF LIMITS

of work to be produced as determined by the tolerance. For example, *K* indicates the low limit of the shaft and *L* the high limit. *M* is the low limit of the hole and *N* the high limit of it. The tolerance for these two pieces would be indicated by *L*—*K* in the case of the shaft, and by *N*—*M* in the case of the hole.

It is advisable for the student to make sure that he has a thorough understanding of these terms before going further with the matter of gaging.

Several examples are given in Fig. 520 which illustrate the methods of setting limits on different pieces of work. In the example *A* a bearing is indicated at *B* and a shaft at *C*. The requirement for this work is that the shaft shall revolve freely in the hole. The first step in determining the proper sizes would be to make a suitable allowance betwen the shaft and the hole, so that a film of oil could be maintained between the two in order to reduce the friction as much as possible. Let us assume that an allowance of 0.0015 in. is made.

We do not expect to machine the parts so that they will all be absolutely the same; but we can determine how great a variation will be permissible, both under and over the sizes required, and still give us two parts which will work together freely and perform their functions as required. We might say that the shaft would undoubtedly revolve freely in the hole if an allowance of perhaps 0.0005 were obtained. It would also undoubtedly work in a satisfactory manner with an allowance of 0.0025 in. It is our business, therefore, to establish the tolerances on the shaft and hole so as to approximate these variations.

We know that the hole must be drilled or reamed and that the tools used for this kind of work cannot be adjusted as easily as those used for turning the outside of the shaft. Hence, the final size of the hole would be determined by the size of the reamer, which, when it is new, is likely to cut slightly over-size. We must also consider that the reamer may become worn after continued use and that it will ream the hole slightly smaller than at first, so we must make an allowance for this condition also. In the example given, the nominal size of the hole is 1.000 in. and the maximum limit is 1.0005 in., while the minimum is 0.9995 in. In other words the tolerance on the hole is 0.001 in. which is the difference between the limits.

The shaft being more easily controlled as to its size, can be made —0.001 to —0.002 in., thus giving it a tolerance of 0.001 in. The various conditions which can be obtained in machining these two parts to the tolerances shown will be as follows:

(1)	Max. hole	1.0005 in.
	Min. shaft	0.998 in.
	Clearance	0.0025 in.
(2)	Min. hole	0.9995 in.
	Max. shaft	0.999 in.
	Clearance	0.0005 in.
(3)	Max. hole	1.0005 in.
	Max. shaft	0.999 in.
	Clearance	0.0015 in.
(4)	Min. hole	0.9995 in.
	Min. shaft	0.998 in.
	Clearance	0.0015 in.

It will be seen from the foregoing that we can actually obtain four different results, depending upon the accuracy with which the work is machined; yet, as a matter of fact, the gages used in the hole would tend to keep this dimension slightly under the maximum size and those used on the shaft would tend to keep this dimension slightly over the minimum size, so that in all probability the maximum clearance which would be obtained between the two parts would approximate 0.002 in. Also, the plug used in the hole would not permit the work to drop quite to the minimum diameter, as otherwise the plug would not enter freely. The snap gage used for the shaft would not pass over the work freely unless the maximum diameter were slightly smaller than the gage. For these reasons, we can safely assume that the allowance which we have previously determined upon will be approached very closely when the parts are machined.

We have made this explanation in order that a clearer understanding may be obtained of the principles used in establishing tolerances on interchangeable work. Several other examples are given in the same illustration to show the application to somewhat different conditions. In the diagram at *D* there are two holes, respectively, 1.250 and 0.750 in. in diameter. The larger hole does not require very close tolerances, while the smaller must be more carefully made. This is clearly shown by the difference in the tolerances on the two holes. The depth of the hole is shown as 1¾ in. and both limits are given as +, so that the shoulder shaft which enters this hole will never bottom on the surface *E* but will always have clearance at this point.

One other example is given in this illustration at *F*, which shows a slide *G* and a saddle *H*. The chief requirement for the work is that the slide shall move freely in the saddle, but without side play. The tolerances are so given that there will be a maximum clearance of 0.002 in. and a minimum clearance of 0.0005 in. There is a difference in practice on this class of work, as the parts are to be fitted to each other by scraping. The slide can be made up so that it is slightly larger than the saddle and the fit determined by the workman. This is a matter which should be settled according to the practice in vogue in the factory where the work is to be done.

Various Kinds of Fits

The manufacturing of work requires parts to be fitted in several different ways, and tolerances are established to produce these various fits. One of the first things to be considered is the meaning of the different terms, and we have endeavored to illustrate the terms in graphic form in Fig. 521.

A *Running Fit*, an example of which is shown at *A*, is a term which is usually applied to the relation between a shaft and a bearing. The parts must be so proportioned that the shaft will run freely. There are several grades of running fits, according to the class of machinery to which they are applied. Naturally a precision machine tool designed to produce work of the greatest accuracy would have its various parts carefully fitted, and the allowance in the bearings would be small in order to avoid any inaccuracies. In a farm tractor, a concrete mixer or some other mechanism designed for use under severe conditions, the allowance for a running fit might be considerably greater. Tolerance tables which specify the limits required for different kinds of fits usually give several classes under the heading of running fits in order to provide for different kinds of mechanisms. Naturally, each manufacturer must be governed in his selection by the requirements of his own work.

A *Push Fit*, an example of which is shown at *B*, has a smaller allowance than a running fit and it is not essential that the parts should be free to revolve. They should, however, be so proportioned that they can be assembled by hand without using much pressure. Push fits are used for studs, jacks, or other parts which may be assembled and held in place by a setscrew or pin.

A *Drive Fit*, an example of which is shown at *C*, must be assembled by pressure such as that which can be applied by means of an arbor press or by driving with a hammer. Fits of this kind are very common in machine shop practice for parts which must fit each other closely, yet which do not necessarily drive by the friction between the shaft and the hole.

A *Force Fit*, shown at *D*, requires heat to expand the hole and extreme pressure such as that produced by an hydraulic press to assemble. When parts are assembled by means of a force fit, they practically form one unit and cannot be readily separated.

Hole as a Standard

In establishing tolerances for the majority of manufacturing work the hole is generally used as a standard, because it is usually machined by means of standard tools such as drills, boring bars, reamers, or by a grinding operation. For the ordinary kind of manufacturing work the reamer is used to size the hole; and as it is not particularly easy to make a reamer so that it will cut a hole which varies greatly from the outside diameter of the reamer, this fact establishes a reason why the hole is usually used as the standard of measurement in setting tolerances. We have previously mentioned the fact that a new reamer is likely to cut a trifle over-size, and that after it has been worn somewhat it may produce a hole slightly under-size.

It is not customary to specify limits on a drilled hole, but those which are to be reamed or ground can be machined within very close limits of accuracy. It has been pointed out that tolerances for holes can be separated into several classes, the most accurate being those for holes produced by the grinding process, next those which are reamed, and finally those which are bored or produced by a cutter head or something of this nature. After determining the accuracy required in a given hole, the tolerance must be set and the shaft or studs

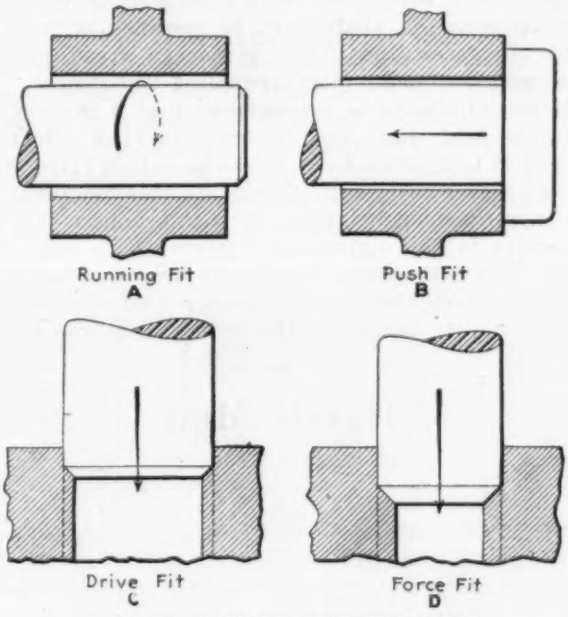


FIG. 521—VARIOUS KINDS OF FITS

which enter the hole must be proportioned in accordance therewith.

There are so many factors which influence the setting of tolerances for different classes of work that it is difficult to give the figures covering a limit system which will apply equally well to all kinds of work. Each manufacturer must create a law unto himself, and determine by practical experiment just what tolerances are most suitable for his own shop. After the tolerances have once been determined there remains only the matter of placing the figures for the limits on the part drawings, and then of designing gages to keep the parts within the required limits. There are a number of tolerance tables in existence, and they have been tested on certain classes of work and found satisfactory. We are not giving any of these tables here, because they can readily be obtained both from text books on gaging and also from several well known gage manufacturers, as well as from the standard handbooks.

It is of vital importance for the engineer who is called upon to establish a system of tolerances for a given mechanism, that he should understand thoroughly the working of the various parts which go to make up the complete machine. A broad knowledge of the operation of the device, combined with excellent judgment and backed by many years of shop experience, are essential

factors in setting limits on manufacturing work. Keep always in mind the fact that the wider the tolerances can be made, consistent with the quality of the product to be manufactured, the greater will be the economy in manufacture. It is gratifying to note that many factories have established their own systems of gaging during the past decade, and that they have at the same time made radical improvements by incorporating on their part drawings the limits for all of the important fits.

In this connection, however, a point of value may be brought out, and that is the lack of a standard practice in establishing limits on shaft shoulder distances. If any mechanism is to work properly, the shoulder distances on shafts should be given tolerances such that the parts will assemble freely and without the necessity for fitting because a certain shoulder is a trifle longer than it should be. As a general thing, the shoulder distances on shafts can be specified with fairly wide tolerances, and if this is done a great improvement will be found in the assembling department.

It should always be remembered that it is more difficult to hold shaft shoulders within close tolerances than it is to produce holes or shafts within given diameters. Hence, as much latitude as possible should be given on shoulder distances. It is both unnecessary and expensive to hold unimportant parts within very close limits of accuracy, and there is no branch of tool engineering which reveals the experience of the engineer and his ability more than the setting of tolerances.

Handy Men

By George Walter
In Charge of Maintenance, Millholland Machine Co.
Indianapolis, Ind.

DID YOU EVER try to classify the men who are engaged in the maintenance and repair work of your shop? Have you ever tried to ascertain whether or not your electrician was an electrician fully qualified to draw an electrician's wage? Have you found that your millwright is capable of setting a machine with the precision that is expected of a millwright? Or have you found that you have a number of "handy men" in your employ?

Handy men are and always will be an integral part of the organization of a machine shop. The mistake seems to be in giving them a payroll rating above that which they really merit. I have known comparatively small shops struggling along for an existence, with a shop carpenter, a millwright, a machine repairman, an electrician and an oiler on their payroll.

The electrician spent most of his time renewing fuses, replacing lamps and smoking cigarettes in the boiler room. The carpenter spent part of his time making boxes for the shipping department and arguing for hours as to which was the best way for routing a shipment. The millwright always seemed able to find a set screw which needed tightening when the boss was around. The machine repairman could always find a lever which needed adjusting and the oiler was always busy oiling when not engaged in passing on the shop gossip.

Here we have five men drawing five men's pay and each idle more than fifty per cent of his time. Each depended on the shop superintendent for orders, when the superintendent was so occupied with production, that he did not have time to give maintenance the attention it deserved. He left it to the men. Each one had convinced him in some way that he was a necessary part of the shop equipment.

Yet when the time came for a motor to be repaired an expert had to be brought from the factory where it had been built. Two weeks were lost while the electrician tinkered. "Faulty construction" was his verdict and the motor would have to be completely torn down. He didn't have the equipment at hand to do the job, so it would have to be sent out. The factory was notified and an expert came. The expert was nothing more than a first class electrician, yet within two hours the motor was running.

Other Examples of Limitations of Maintenance Men

A new lathe came in, late and sorely needed for production. The millwright hurriedly bolted the countershaft to the angle iron above, dropped a bolt tied to a piece of binder twine from the cone pulley and lagged the machine down. The belt began to climb the cone pulleys. Obviously they were out of line. The next day the machinist on the lathe announced that the company "had got stung." A job of boring was out 0.003 in. on one end. A check-up showed two blocks of wood placed under one end of the lathe to line the pulleys up, with the result that the ways were irreparably twisted out of shape.

When a new cabinet was wanted in the tool crib, it had to be purchased ready made. The carpenter did not have the tools for that kind of work—perhaps not the ability. An oiler was being maintained to do nothing but oil. Yet, the machine repairman was spending most of his time inserting bushings in loose pulleys which had run hot. It also happened that this was about the only kind of work he could do thoroughly.

Every machine shop must have its handy men but they should be rated as handy men. It is a large shop indeed which can afford in each unit a fully qualified man at the head of each division of its maintenance department. The personnel of the maintenance department can be so arranged that when the electrician or the millwright needs help he can call for a handy man. The handy man should actually be a handy man with the ability to handle tools well.

Any man with a little mechanical ability can handle a hammer and saw, renew a blown out fuse or lamp, lace up a belt with the patent lacers used in the present day, or use a pipe wrench. If he really has the "makings" in him he will not take offense at the title of "handy man," but realize that he has before him the opportunity for gaining much information at first hand.

If each electrician, millwright, and machine repairman has his own individual helper there will invariably come times when these men are absolutely idle. Perhaps there may be ten helpers in the shop working at different kinds of work. It may be found that the total work done by these men would not exceed that of five if the five were kept busy all the time. Why not five handy men and one man in charge of the entire maintenance department to place these five where most needed? The wages of the other five cut in half would make an attractive salary to offer such a man.

In the small shop one man can be in charge of all maintenance work with as many handy men as he needs to help him. When a big repair job comes up, the firm will then find it cheapest to send it out. If the maintenance man is worthy of his salt, things will be kept in good condition and he will be occupied with the "upkeep" and not the "repair" of the plant machinery.

Control Systems for D. C. Motors Applied to Machine Tool Drive

By B. S. PERO
Power and Mining Engineering Dept., General Electric Co.

The manually operated, the remote and the automatic controls—A control for constant uni-directional speed — Difference between adjustable and varying speeds

ALL THE MODERN systems of control for electric motors as applied to machine shop use have been designed with two particular requirements in view, that of convenience and reliability in operation, and that of safety to the operator. The former requirement becomes important when it is realized that actual labor cost, which is a function of the time taken to produce any given article, forms about 60 per cent of the total production charge against that article, regardless of its size or quantity. The importance of the safety element is too obvious to require further discussion. Within the past ten years a number of control systems have been standardized to fit the requirements of machine tool drive. The selection of the most advantageous system for any given case, therefore, becomes largely a matter of fitting the characteristics of the various types of control to the conditions, labor and the class of work in the shop where the installation is to be made. To accomplish this plan successfully, however, a thorough understanding of the control characteristics is necessary.

The trend of modern control systems is toward simplicity and safety, the former to the highest degree compatible with the work to be done and the latter to the highest degree possible.

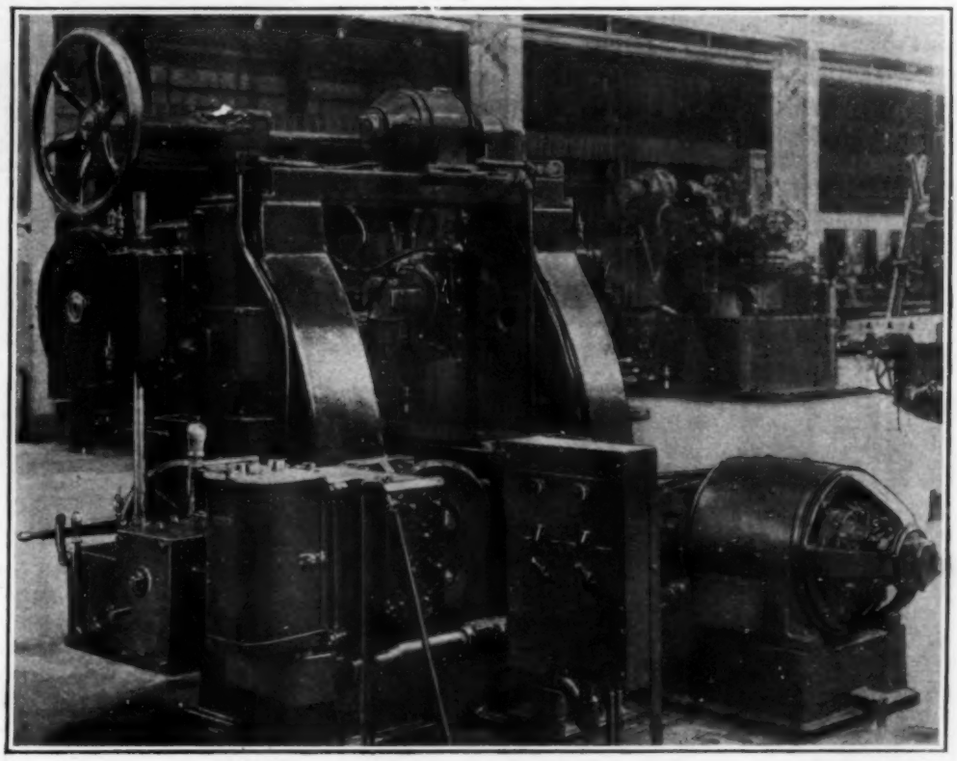


FIG. 1—A NEWTON DUPLEX MILLING MACHINE WITH DRUM CONTROL

All the systems may be divided into three general classes, the manual, or hand operated, the remote control and the automatic control. The main idea in the design of all these systems has been centralization, that is, to have the master element, switch, drum controller, push button, or whatever it is, accessible in the highest sense of the word to the man who is actually running the machine. This idea has been so successfully accomplished that operators may have accurate control over the direction of rotation and speed of their motor, without taking one step away from their work, even on the most complicated form of machine tools. Since the manual control systems are the simplest, both in design and operation, they will be described first.

The simplest form of manual direct current control consists of a self-contained rheostat having a movable handle and a graduated resistance which is connected in series between the line switch and the motor terminals. Starting the motor is accomplished by moving the handle through an arc, and the contact on the arm moves over a number of studs which vary the amount of resistance in series with the line The contact arm is held in the running position by a magnet coil, which is energized when the last resistance point is passed.

The magnet coil also furnishes undervoltage protection. When the voltage drops below a certain value, from failure on the line, or if the line switch is opened, the magnet coil releases the contact arm. The latter

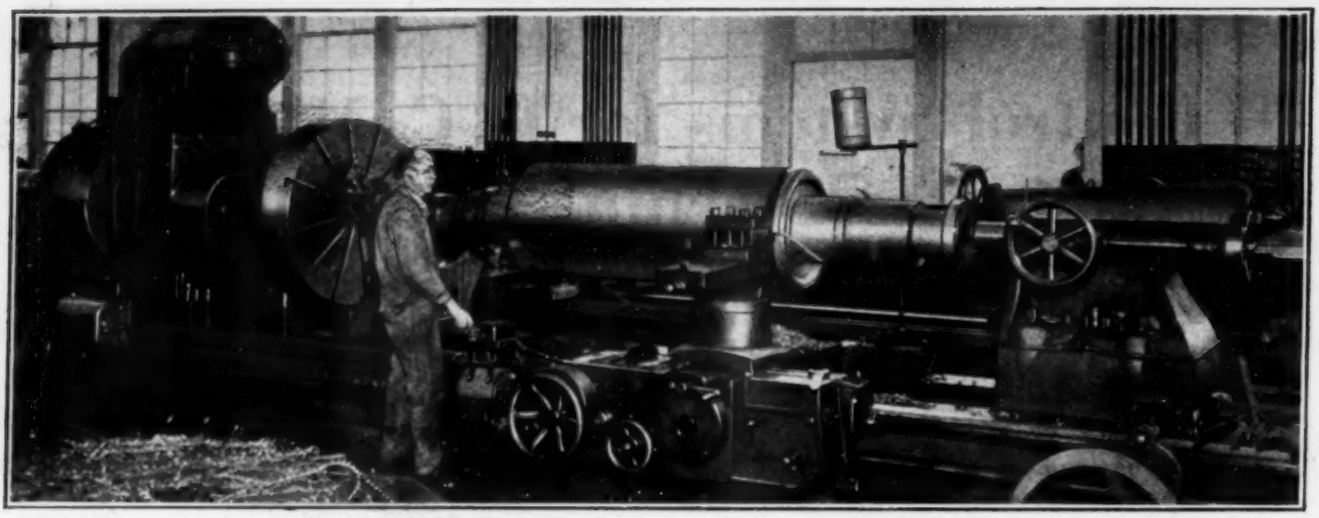


FIG. 2—A MANUALLY OPERATED DRUM CONTROL OPERATED BY MEANS OF A SPLINED SHAFT THAT DRIVES THE CONTROLLER HANDLE THROUGH A CHAIN

is pulled back to the off position by a spring. This feature of the control prevents the sudden or unexpected starting of the motor on return of the voltage, or in case the line switch should be closed at an inopportune time.

Such rheostats are used for the control of machine tools which have a simple duty cycle and require only constant speed and uni-directional rotation. They are adapted very well to machines that are subject to continuous use. The control is used, in connection with a separate line switch, to control motors of from one to 150 hp. operating a group of machines driven by belts from a line shaft. Their field of application is more or less limited, because they give no graduations of speed or reversals, and overload protection must be furnished from an external source. They are not suitable for frequent operation.

The next stage in the refinement of a direct current manual control apparatus is the drum controller system. It is applicable to machines whose duty cycle requires both constant and adjustable speed forward or reverse and frequent starting and stopping. A typical system of this sort consists of a drum controller with several accelerating, running and reversing points, necessary armature and field resistors, and a protective panel which povides both undervoltage and overload protection.

Undervoltage protection is furnished by a shunt contactor that opens when the voltage falls below a predetermined value, can be re-energized only by returning the controller handle to the off position. This provision prevents the motor from starting unexpectedly on return of voltage. Overload protection is furnished by a single or double pole overload relay connected in series with the main line and the coil of the previously mentioned contactor. This relay causes the contactor to open which disconnects the motor from the line when an overload takes place. Fig. 1 is a good example of drum control, showing how the controller can be located conveniently for the operator. He can control the speed of the machine and watch his work at the same time, without moving about.

The design of drum control equipment is such as to allow a high degree of centralization, as the controller

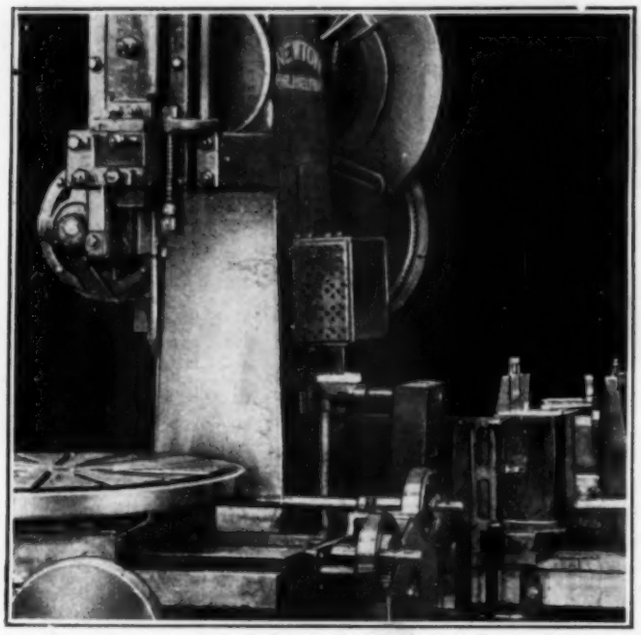


FIG. 3—ANOTHER EXAMPLE OF MANUALLY OPERATED DRUM CONTROL WITHOUT MAGNETIC FEATURES

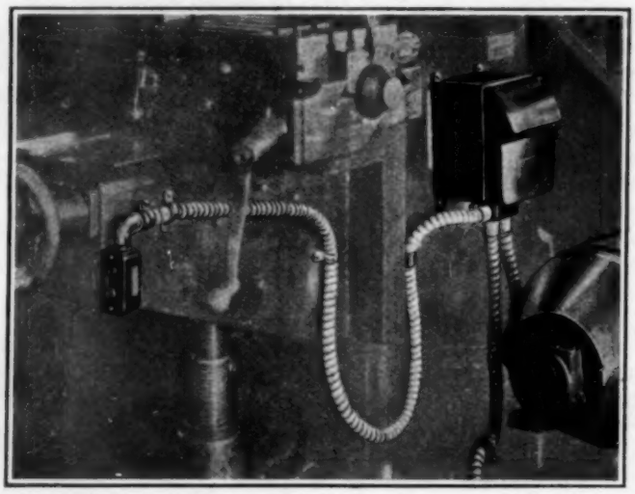


FIG. 4—MOTOR CONTROLLED BY MAGNETIC STARTER ACTUATED BY PUSHBUTTON STATION

can be mounted anywhere that best suits the convenience of the operator. For example, in the case of lathes, it is often the custom to mount the drum controller on the lathe bed, and operate it from the apron of the lathe, by means of a splined shaft. Fig. 2 is a form of manually operated drum control showing the method of operating a distant drum controller by means of a splined shaft that drives the controller handle through a chain. It can be seen what close control the operator has over the machine while also having close observation of his work.

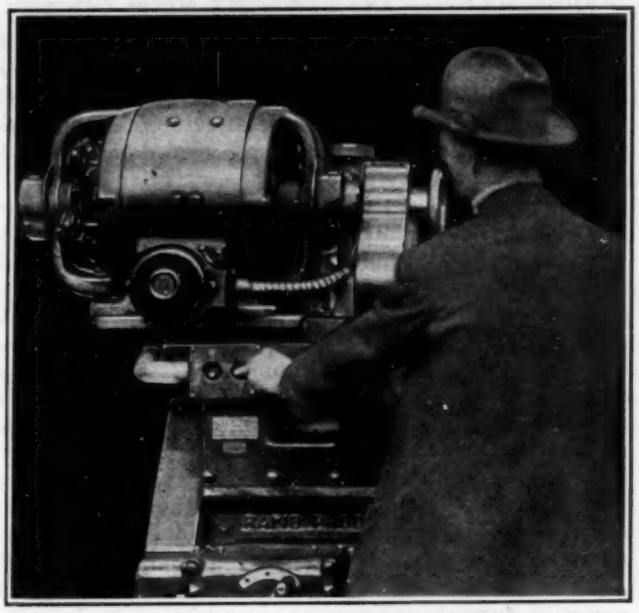


FIG. 5—THE D.C. MOTOR CONTROLLED BY MAGNETIC STARTER THAT PROVIDES FOR NON-REVERSING ADJUSTABLE SPEED OPERATION

Drum type control is much used on individually driven machine tools, such as lathes, milling machines, boring mills, or in fact any machine where the complicated duty cycle must always be under the direct control of the operator. Fig. 3 is another example of manually operated drum control without the magnetic features.

A couple of cases in point will serve to illustrate the conditions of machine operation in which drum control is valuable. In the case of a lathe, for example, turning on a small diameter requires a fairly high, constant speed. The next operation may be on a larger diameter, necessitating a reduction in the speed to maintain the same cutting speed. The operator is the only judge of when, and to what degree the speed must be reduced or increased, and, with a drum controller he can accurately adjust the exact speed he desires. The operator can, with drum control, watch the progress of his work, and effect the proper speed change at the exact instant it is required

Another case that offers a good example of the necessity for good speed control is that of a lathe working on a job that requires tapering. Here the operator must gage the speed of his motor entirely by the appearance of his work, and at the same time his control over the speed must be accurate. Cases such as these could undoubtedly be multiplied indefinitely, but these are enough to show requirements that can best be met by drum control. In both of them automatic control would be at a disadvantage because it would be exceedingly difficult to lay out an inexpensive automatic system sufficiently sensitive to take care of all the thousands of special conditions that arise.

On the other hand, as machine tools increase either in size, or in complication of duty cycle, or both, there comes a stage where the drum control apparatus needed to handle the motors manually, would be so cumbersome and complicated that its advantages of flexibility and accuracy would be more than offset by the time and energy needed to operate it. It has also been found desirable, especially with motors of the horsepower required on large machine tools, to take the matter of proper acceleration out of the hands of the operator for several reasons. Not only are damages to the motor or machine and electrical disturbances on the line arising from improper and careless operation avoided, but time is saved for the operator as well, allowing him to concentrate his attention on his work. These factors, together with the increasing use of automatic machine tools of various sorts, have been largely responsible for the development of magnetic control apparatus.

Magnetic Control Flexibility and Simplicity

Magnetic control would probably not have reached its present degree of flexibility and simplicity, however, were it not for certain improvements that have been made in the design and construction of the motors used to drive machine tools. Briefly, the more important of these are, improved commutation, and a reduction in the diameter of the armature, which both permit of faster acceleration, the former by precluding line disturbances, and the latter by reducing the inertia of the armature. The latter factor is of especial importance in the case of motors on machines where the duty cycle calls for frequent reversals.

Magnetic control can put a motor on the line at full speed, faster than could be done manually, assuming

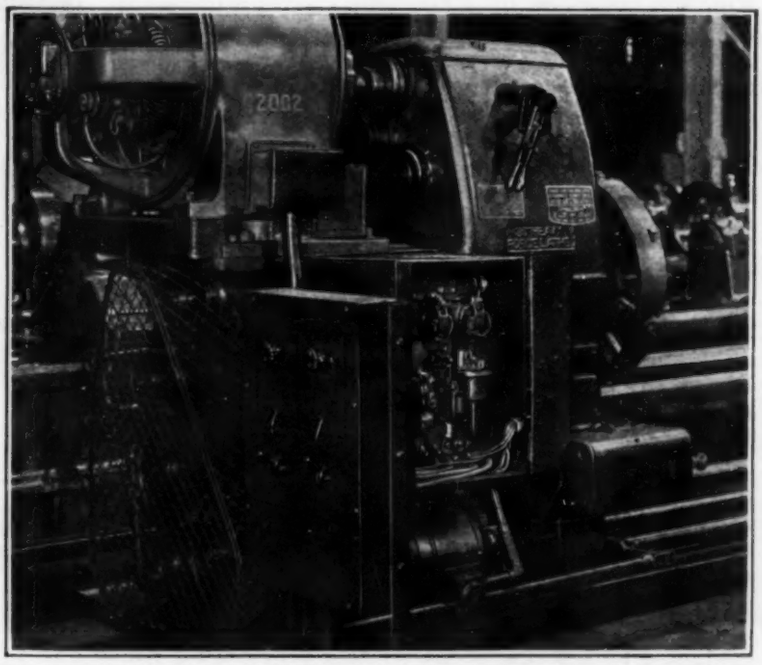


FIG. 6—A FOOL-PROOF COMBINATION OF DRUM CONTROL WITH A MAGNETIC EQUIPMENT

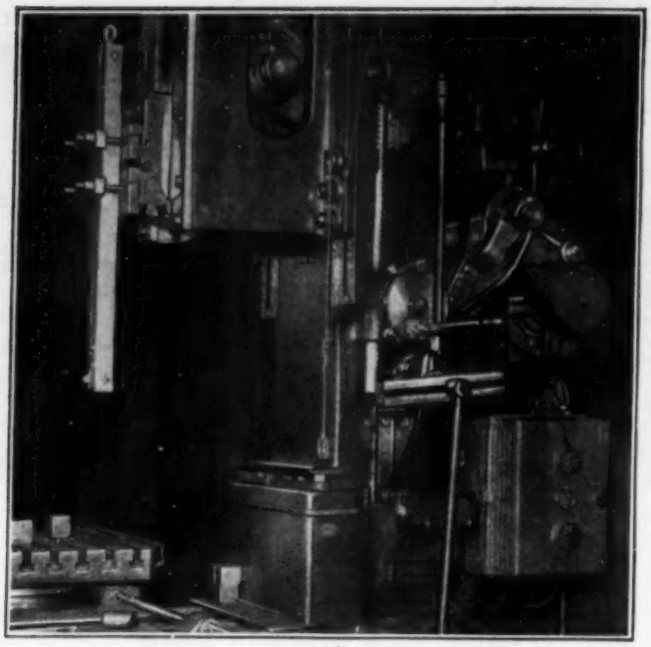


FIG. 7—THE HIGHEST TYPE OF AUTOMATIC MAGNETIC CONTROL

proper attention was given by the operator to the acceleration sequence of the motor. In addition, all magnetic equipments of the General Electric Co. furnish full protection in case of undervoltage and overload, besides being fool-proof as far as the operator is concerned. They are highly centralized by means of the master elements used with them, as can best be shown by a consideration of the various types and their application.

The simplest form, which is used with a two-button pushbutton station is designed for the automatic control of motors used for work requiring constant unidirectional speed. It consists of a line contactor, accelerating contactor, or contactors, depending on the capacity of the motor. The motor on the machine in Fig. 4 is controlled by a magnetic starter actuated by a pushbutton station with two buttons (start and stop). This form of control is for constant speed applications, where no reversing is required.

Other Simple Control Forms

If a panel without line switch is furnished, we recommend using a separate safety type double-pole line switch mounted in a punched-steel enclosing case. The case is a safety feature, as the switch cannot be closed when the case is open, or the case opened when the switch is closed. The use of a pushbutton control furnishes undervoltage protection, as the machine cannot be re-started after failure of voltage until the "start" button has been pushed. The starters of the General Electric Co. are operated by pushbutton control and have from one to seven accelerating contactors, according to the horsepower of the motor with which they are used. They automatically accelerate the motor to full speed in the minimum time consistent with safe current values in the motor, preventing either undue disturbance on the line, or the subjection of the driven apparatus to objectionable shocks.

In Fig. 5 is shown a lathe driven by a d.c. motor controlled by a magnetic starter that provides for non-reversing, adjustable-speed operation. In this case, under voltage protection is provided by an under voltage pushbutton station. Starting and stopping is accomplished, as can be seen by a pushbutton station mounted on the lathe.

These simpler forms of control are not particularly flexible as regards speed variation, or reversing. They are especially valuable, however, in shops where operators are unused to the handling of electrical apparatus; or where there is a large amount of routine work. They save power, because motors can be stopped when not needed, and started again without loss of time.

Adjustable-Speed and Reversible Motor Controls

Naturally, the control equipment required for adjustable-speed motors, or those on machines where reversing is required, is fairly elaborate. It might be well, too, to differentiate between adjustable speed, and varying speed. The former type, once determined, is practically constant for all loads, while, in the latter case, the speed reduction is obtained by a series resistor in the armature circuit, and a definite speed can only be obtained with a definite load. Also, the loss in the resistor, is, under certain conditions, high. For instance, when a motor is operated at half speed, by this method, the loss in the resistor is equal to the motor output. Magnetic control giving adjustable speed can be operated by pushbutton stations and a separate field rheostat or a master switch which controls the line contactor and field resistor.

Reversing equipments may or may not be designed for adjustable speed as well, depending on the duty cycle of the machine they are controlling. They are operated by means of either three button stations with separate field rheostat, or master switches. Both varieties furnish under-voltage protection, and in the case of reversing, or where quick stopping is required, dynamic braking is provided.

An example of a combination of drum control with

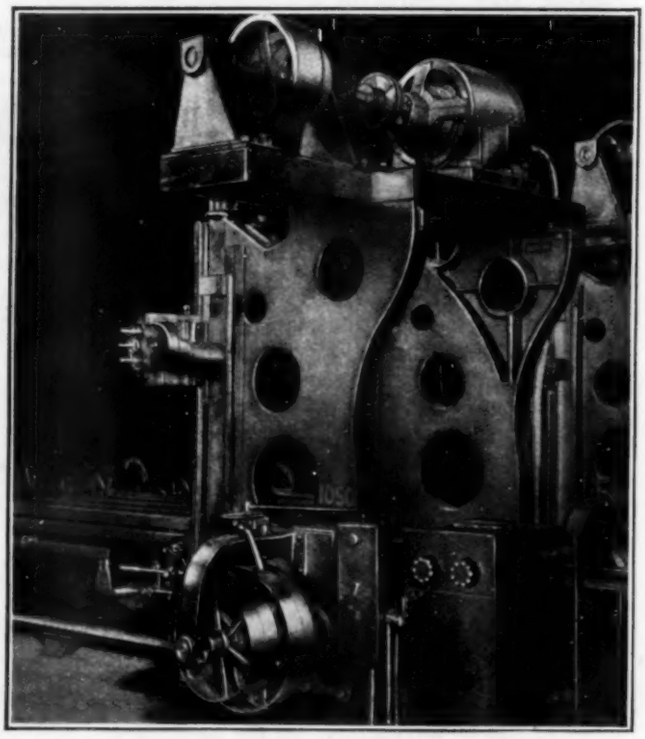


FIG. 8—FULL AUTOMATIC PLANER CONTROL THAT DOES NOT PROVIDE FOR REVERSING

a magnetic equipment is given in Fig. 6. The drum controller energizes the line contactors and field points, and provides under-voltage protection. Such an equipment is practically fool-proof. The motor is always started and stopped in a uniform manner, and is prevented from carrying injurious overloads.

A concrete example of a machine tool, the load characteristics of which call for adjustable speed at the discretion of the operator, and to which magnetic control with pushbutton stations has been successfully applied, is found in the large car wheel lathe. These machines are driven by adjustable speed motors and are used for turning down the treads and flanges of coach and driving wheels already assembled on the axles. The metal is removed at a rather high rate, and, especially, when the wheels have been in service, there are hard spots, which require slowing down in order to save breaking the tool. The control used with this machine consists of an enclosed panel carrying a line contactor, an accelerating contactor, a "slow down" contactor, a double throw knife switch for emergency reversing, and a separately mounted enclosed field rheostat, by which the desired basic operating speed is set. The devices on the control panel are actuated through a three button pushbutton station, the buttons being start, stop, and slow speed. There are other ways of mounting the pushbuttons, but since the essential action is the same in all cases, their details are superfluous.

Operation of Magnetic Control Equipment

In operation, suppose, with the machine running at normal speed, and load, the tool strikes a hard spot in the metal. By depressing the "slow" button, the "slow down" contactor, which is normally closed, is opened, and in opening, de-energives the accelerating contactor. An auxiliary contact on the accelerating contactor short circuits the field rheostat, applying full voltage to the motor field. The accelerating and "slow down" contactors, in opening cut the starting and slow resistors into the circuit. Since the speed below normal or basic speed is obtained through resistors in series parallel with the armature, the amount of speed reduction actually obtained will depend somewhat on the load. This is a fair sample of what may be done with magnetic control equipment. The pushbutton stations can be mounted wherever desired, so as to be most accessible to the operator, and the action of the equipment is sufficiently rapid to take care of any exigencies that may arise, and prevent damage to the machine.

The highest development in automatic systems is probably that applied to the control of reversing planer drives. This control is fully automatic, to the extent that having once set the machine in motion, the operator has no control over the cycle, the utmost he can do is to change the speeds or stop the machine in case of emergencies, or whenever desired.

In Fig. 7 is an example of the highest form of automatic magnetic control. The machine is started and stopped by means of the pendent pushbutton station that can be seen hanging at the side of the frame. The rest of the operation, such as the acceleration, reversing and dynamic braking is taken care of by apparatus in the large box mounted on the planer. Fig. 8 gives a form of full automatic planer control that does not provide for reversing and therefore is not as complete as the one that Fig. 7 shows.

Without going into details, it may be stated that planer control as now developed, provides for one range of speed on the cut stroke and another on the return, the motor being reversed automatically through contactors actuated by a trip switch on the planer bed. Furthermore, over-travel is prevented, either on reversing, in case of voltage failure, or when the planer is stopped for any reason, by the automatic application of dynamic braking to the driving motor. Practically all that the operator has to do on such machines is to set up his work, start the machine, set the "cut" and "return" speeds, and oversee the cutting process.

Standard Sizes for Catalogs

Our short article on the advisability of adopting standards for sizes of catalogs and similar literature which was published in the *American Machinist*, page 757, Vol. 57, 1922, and in the European edition on Jan. 6, 1923, has attracted the following comment from the Normenausschuss der Deutschen Industrie, the German national standardization body:

In the *American Machinist* of January 6th, 1923, you report that you have examined the size of the catalogs sent to you and found in this connection that in the main there are involved a few definite sizes. These sizes you propose for standardizing purposes. You will be interested in learning that such work has already been started at different times in all countries of the world, but that on this basis it has been impossible so far to arrive at any agreement because there was involved not the regulation of a single size only but rather the relations of many sizes to each other, which is of much greater importance. The tabulation of entire series of sizes is what is involved.

In Germany, too, a number of years ago the same procedure which you have started was resorted to, but the establishment of an average or standard size was soon abandoned, and rather the establishment of an average size for operating blanks, letters, records, index cards, booklets, periodicals, etc., was called for. The result of many years' negotiations between the German authorities and German industries was the agreement to a systematically built up series of sizes which in their effect is comparable to the legal system of measurements. This is the series A of the D I N sizes which has lately also been adopted by the government departments and which in the future will regulate the bulk of paper consumption. For business letters the size 210 x 297 mm. has now been established, and this at the same time applies to advertising matter, index cards and periodicals. Half of it, 148 x 210 mm., is considered as a note sheet, index card, etc. One quarter is the postal card, 105 x 148 mm.

It is interesting to note that the German standard letter size, according to this communication, is $8\frac{1}{4}$ x $11\frac{5}{8}$ in. as against our $8\frac{1}{2}$ x 11 in. This is almost close enough for ordinary purposes. When it comes to post card sizes, however, there is more of a spread. Theirs is $5\frac{13}{16}$ x$4\frac{1}{8}$ in. as against our $5\frac{1}{2}$ x $3\frac{1}{4}$ in.

Manufacture of Lubricating Greases, 1921

The Department of Commerce announces that, according to reports made to the Bureau of the Census, the value of products of establishments engaged primarily in the manufacture of lubricating greases amounted to $8,912,000 in 1921, as compared with $8,869,000 in 1919 and $4,919,000 in 1914. This classification includes firms producing axle grease and hard and soft lubricating greases as distinguished from lubricating oils.

In addition to the production by the establishments in the classified industry, establishments assigned to other classifications, principally "petroleum refining," reported lubricating greases as subsidiary products to the value of $10,761,000 in 1921, $9,343,000 in 1919, and $4,049,000 in 1914.

The Fourth Progress Report of Gage Steel Investigation

THE THIRD report of the Gage Steel Committee of the Bureau of Standards indicated that steel containing 1.4 per cent chromium in the form of 1 in. diameter cylinders did not harden completely. The fourth progress report, issued recently, states that since then five specimens having graded physical properties were sectioned and examined under the microscope for troostite, the soft constituent of hardening. All the specimens hardened in oil were found to have troostite, the amount varying with the quenching temperature. The Brinell hardness measured at the center of the section gave a good indication of the amount of troostite present. Rough indications of the amount of troostite were also obtained by noting the change in length and the magnetic properties of the specimens.

Contrary to expectations, the troostite was found fairly uniformly distributed over the whole sections instead of being concentrated in the center and surrounded by a martensitic shell. The uniform troostite distribution implies that the oil quenching is done at a uniform rate. The condition is verified by mathematical calculations and accounts for the lack of file hardness in the oil-quenched specimens.

Testing for Martensitic Specimens

To find what diameter specimen would harden completely in oil, without troostite formation, bars made up of 2-in. cylinders and respectively, $\frac{7}{8}$, $\frac{3}{4}$, $\frac{5}{8}$ and $\frac{1}{2}$ in. in diameter were quenched in oil at 810 deg. C. The $\frac{1}{2}$-in. section alone was martensitic to the center. The $\frac{5}{8}$-in. section showed very little troostite, so gage specimens 4 in. long were made up having this diameter to determine whether there is a real difference between oil and water quenching when the final structure is entirely martensitic in both cases.

It seemed highly probable that at least part of the changes in gages with time were due to internal stress. The magnitude and sign, that is, compression and tension, of the longitudinal stress may be roughly determined by the Martens and Hayn method, namely, by turning off peripheral layers and measuring the change in length. From the change in length, diameter removed and length, the stress can be computed. This was tried on the five specimens in regard to troostite distribution. The diameter was reduced over a 3 in. length successively in 0.05-in. steps and the change in length from the initial length as quenched and aged measured for each step.

The measurement showed no relation between the amount of troostite and the stress. Thus two specimens, one nearly all troostite and the other all martensite, changed on the first two grinds in the same direction and magnitude. A significant fact, however, is that the specimen which was cooled slowly through the hardening change showed a definite increase in length on the first grind.

There is one striking regularity in the data for ageing over 30 days, namely, that all those showing a plus change or increase in length are specimens which were cooled slowly through the hardening transformation. Thus, two specimens cooled in air from 410 deg. C. showed an increase in length by nearly 0.005 in. in 67 days, while a pair cooled in water from the same temperature shrunk by the same amount.

No less striking is the lack of any apparent relation between the constitution of the specimens and the time changes. The specimens represent martensitic contents of from nearly 0 to 100 per cent with no decided parallel ageing changes. Also, the specimens which are nearly completely austenitic, change in the same direction as the martensitic specimens. These two features of the time changes indicate that their primary cause is internal stress.

While the single values of length changes over a definite period are valuable for comparisons, they are not necessarily reliable as an indication of the freedom of gages from time to time. Thus, a specimen showed a change of only 0.00002 in. in 97 days, but observations showed an increase in length of 0.00034 in. in the first 12 days and a decrease to the former value for 97 days. A number of oil specimens showed this change but not the water specimens.

These observations suggest a number of obvious experiments to check the conclusions. For example, if the rate of cooling determines the stress distribution, it should be possible to select a rate that will give zero stress. This might be accomplished by varying the temperature of the quenching medium and to do this effectively oil must be used. Here, the difficulty of not being able to obtain an entirely martensitic interior is again met.

The presence of austenite is probably of some importance in connection with dimensional changes and ageing of the gages, and tempering curves appear to offer a reliable criterion of its presence. When the mean length change of a specimen is plotted against the tempering temperature, the amount of austenite as revealed by the difference between the maximum change at the peak and the preceding minimum should depend on the quenching temperature.

Why Men Apply for Boys' Jobs

By George E. Hodges.

On page 417, Vol. 58 of *American Machinist*, A. W. Forbes asks why men apply for boys' jobs. It seems to the writer that our industrial system creates a great number of men requiring years to find the line in which they can find success. They are the byproduct of that great American institution, specialized labor.

No boy relishes the idea of a four-year apprenticeship, at small wages, when he can make enough to satisfy his modest wants by rushing telegrams, packing sugar or any other common calling. He sees, even as we see, men on specialized work making good wages as compared to a toolmaker even in shops where toolmakers are employed. Why should he study, he reasons in the optimism of his youth; opportunity will find him eventually. After he has given opportunity what he thinks is a sufficient time to locate him, he decides to look her up. The looking up process takes varying lengths of time with different men. Some men never get her address. These men are desperately in search of opportunity—the very reason why men apply for boys' jobs.

What industry needs is to adjust the apprenticeship system to fit the men to win success in the field in line with their ambitions. Most of the men who apply for jobs with a little opportunity can be readily trained into efficient help. How readily it can be done will be appreciated only when one has seen a really good foreman or superintendent demonstrate it.

The Dutch Machine Manufacturer

BY HENRY OBERMEYER AND ARTHUR L. GREENE

Overcoming natural obstacles and solving contemporary problems in Holland — Diesel engine construction — Unions weak—Keeping out German labor

IT WAS THE opinion of a Dutch machine manufacturer that an article on the machine industry of Holland should begin with something like the following explanatory paragraphs:

"The Dutch metallurgical industry presents the unusual feature of the metal working branch brought to the highest stage of technical perfection without there being any metal producing. It is the latter feature which is usually remembered abroad, where it is known that Holland makes a poor showing as a coal-producing country and that she does not possess any deposits of iron or other ores whatever. It may be due to this very circumstance, however, that special care has been taken always to derive therefrom the maximum of useful products."

Here is thrown on the screen the true picture of a country, closely circumscribed, devoid of most of that wealth which the world calls natural resources, her life in her commerce, and yet buckling down with traditional Dutch industry and thrift to make, by her own handiwork, the engines, motors, boilers, locomotives and other machinery for which she would otherwise be dependent on some foreign power or powers.

Holland is therefore significant, not as a present or even potential wholesale manufacturer of machines, but merely as an example of that same industry and initiative which brought to completion the vast irrigation projects of our own far west, establishing through a daring perversity the very thing against which nature had set its barrier. Without trying to capture any world markets and, most important of all, without raising any tariff walls against foreign competition, Holland's machine industry has not only survived in rocky soil, but is growing today by measurable steps. All this she has accomplished by merely working hard, minding her own business, and settling her own difficulties in her own way without recourse to imitation or association.

The largest machine factory in Holland and certainly the best known outside the country is the Werkspoor of Amsterdam and Zuilen, the latter a town near Utretcht. It is officially known as the N. V. Nederlandsche Fabriek van Werktuigen en Spoorweg-materieel, but the shorter title, also used by the company, will suit the purposes of this account. There are probably many American business men who have never heard of the company for, except to the Dutch colonies, it exports little or nothing.

With its roots stretching down into the seventeenth century, the company has contented itself with growing only so fast as the needs of the country required. At the same time it has been among the first to adopt and develop new discoveries in its line, has weathered better than many other European machine industries the present industrial crisis and, by careful management and canny liquidation at the right time, has been able to withstand without permanent damage a disastrous fire last June which destroyed its machines and shops to the amount of 3,000,000 guilders.

FIG. 1—WERKSPOOR WORKSHOPS FOR ASSEMBLING DIESEL ENGINES

The principal achievements of the Werkspoor may be specified as its more or less successful combatting of German competition and its wholly successful and sometimes novel methods of dealing with labor problems. The latter phase will be discussed later in detail.

As might have been expected in the case of Holland, marine engines, particularly those of the Diesel type, have been the Werkspoor's specialty since as early as 1903. Fig. 1 shows the workshops of the company for assembling these engines. The Werkspoor was one of the first companies in the world to acquire the Diesel rights and patents. Indeed, the Werkspoor makes the claim that it was the first to send a Diesel engine out to sea. This engine was a six cylinder, 650-hp. motor for the oil tanker Vulcanus, completed in 1910 for the Anglo-Saxon Petrol Co. of London. This claim has been challenged by another company in Sweden, but the Werkspoor, while admitting that other companies may have begun work on marine Diesel engines at an earlier date, substantiates its claim with facts and figures to prove that the Dutch company was the first to put them into active service.

Features in Diesel Engine Construction

In any case, the Werkspoor plans for the Diesel marine engine seem to have received widespread approval. Nine other companies in various countries have been licensed to use the Werkspoor specifications, among them the Newport News Shipbuilding and Dry Dock Co., the New York Shipbuilding Corporation, and the Skandia Pacific Oil Engine Co., all American concerns. There can be nothing new, of course, in the principle of the Diesel engine; and yet one or two features in their construction as specifically applied at the Werkspoor factories may be worth noting here. Both reversible and non-reversible engines are manufactured, the latter for smaller craft and powers up to 500 b.h.p. The former type, however, lends itself to greater variation.

In Fig. 2 is shown a 1,400 i.h.p. Diesel engine made by the concern, and in Fig. 3 the assembling of a Diesel engine. The avoidance of cracked cylinder heads through overheating and other causes has been a special concern on the part of Werkspoor engineers. For this reason the cylinders and heads are cast in one piece and are constructed to allow considerable cooling space. This space is obtained by leaving each of the four valve-cages free, a device which does not effect combustion in any way. Four covers in the outer wall make the survey and cleaning of the interior exceedingly simple, while, by a patented device, the lower part of the cylinder liner may be disconnected for inspecting the pistons and cleaning or replacing the piston rings. Eventually the piston may be dismounted entirely by taking out the bolts holding it to the piston rod. This design insures accessibility and simplicity to a very high degree, which are the principal advantages of the Werkspoor Diesel engines. According to the engineers it does not require more than a single day to inspect all the pistons of a six cylinder engine after a voyage.

Here as in other departments the Werkspoor does little outside of Holland, Java and the rest of the Dutch possessions. Even in its comparative insularity, however, the company has felt the heavy hand of German competition. "German competition is unbeatable," is the opinion at the Werkspoor. Yet, despite the handicap of more attractive German bids, the Werkspoor congratulates itself that it has succeeded within the past few years in capturing two or three large orders in direct competition with Germany. Such orders have been few and far between during the last two years, however, for the Werkspoor has felt the universal depression in proportion to its activities.

Since 1920 the Werkspoor has sent sugar machinery

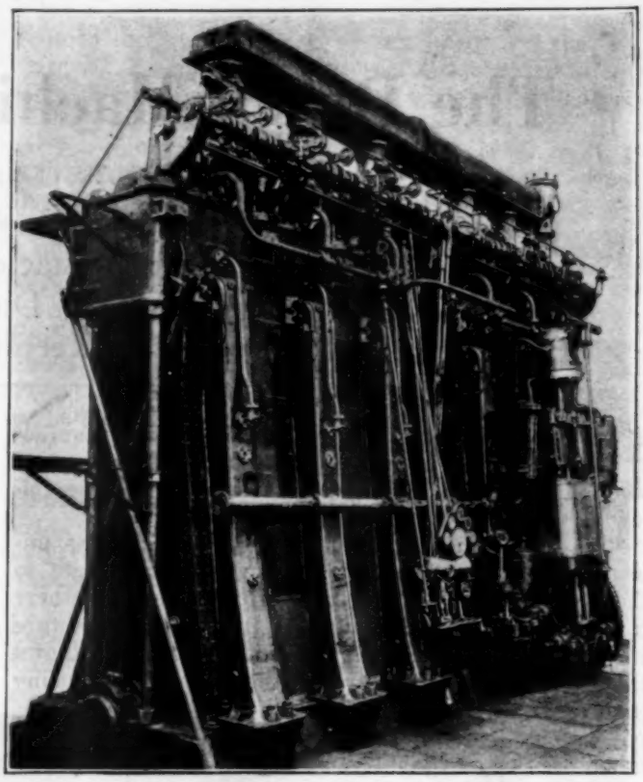


FIG. 2—A 1,400 I.HP. WERKSPOOR MARINE DIESEL ENGINE

to factories in Holland and the Dutch East Indies on rather a large scale, as well as machinery and boiler equipment for some of the biggest steamers of the Dutch merchant marine. Fig. 4 shows a combined condenser and pumping plant for sugar factories. The company has completed two orders of 28 and 20 locomotives respectively for home railroads and for the East and West Indies as well as a total of 1,541 passenger and freight cars. It is worth noting, incidentally, that the two largest railway companies in Holland have the right to nominate one director each on the board of the Werkspoor. Probably the Werkspoor's most important recent order has been that from the government to supply the machinery and turbine equipment of the new armored cruiser Sumatra, which is anchored near the Werkspoor docks at present.

General Conditions in Holland

Most of the competition from Germany is not in marine engines, however, which is England's specialty, But in sugar machinery, locomotives and stationary engines. Nevertheless, Dutch manufacturers are sharply opposed to anything like a protective tariff, being far sighted enough to see that, in their particular case at least, such a policy would do more harm than good. Once machinery was admitted to protection there would be no end to the schedule.

In this respect Holland is in a similar position to England. She produces, however, only about a third of the coal required for her industries and receives practically all her raw iron and other metals from outside sources. Owing to this free trade policy and to the peculiar geographical position of the country, with its elongated nether portion which contains the coal regions, stretching down along the German frontier, the Dutch manufacturer of the north is often able to obtain Dutch coal cheaper by buying it from German dealers.

who have imported it, than from the native mine owners. This fact is owing to the cheaper freightage costs in Germany. German trains bring the coal to the northern frontier, where it is re-imported into Holland.

It is interesting to see that Holland is now making a certain effort to free herself from foreign producers of raw materials in the same way in which she has succeeded in freeing herself from dependence on foreign machine manufacturers. At present it is said that no smelting of any kind is done in Holland. Engineers have been going over the ground, however, with an eye to possibilities, and it was recently announced that a foundry would be started in the near future in Velsen. Thus we may shortly see the Dutch machine industry take another forward spurt, this time perhaps in the direction of an increased export trade.

Meanwhile the Werkspoor, assisted by Dutch legislation, has tackled the problem of labor and unemployment in a characteristically direct and effective fashion. Unionism is known, but is comparatively weak. Employers' organizations, on the contrary, are strong. Nevertheless, wage reductions made necessary by the condition of industry in general, have been slight, and dismissals, while nominally as much as 50 per cent, have actually reached only a fraction of this proportion, owing to special provisions. As compared with 3,320 in 1920, there are about 2,200 men now in the employ of the Werkspoor.

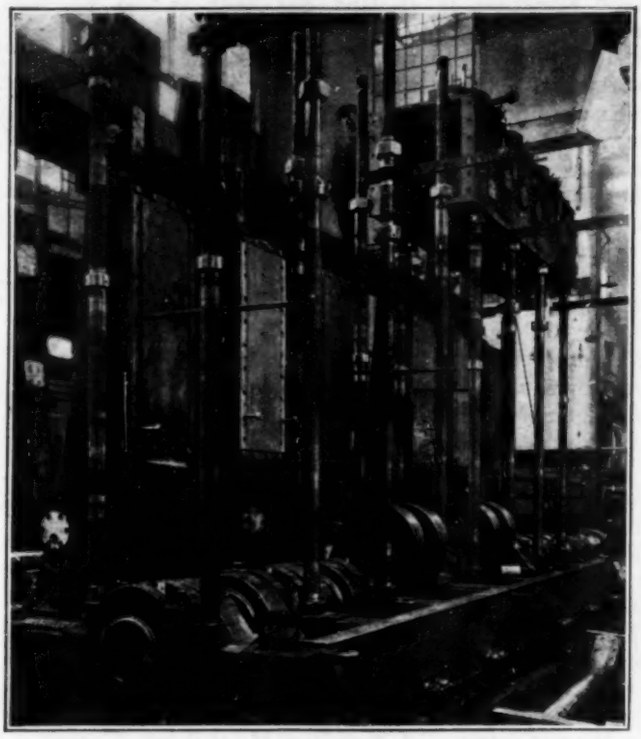


FIG. 3—ERECTING A WERKSPOOR MARINE DIESEL ENGINE

In many ways, especially in employment schemes, welfare work and labor councils, the Werkspoor has been extraordinarily solicitous for its workers, at the same time protecting itself as far as possible against striking unions and impossible demands. Barely 75 per cent of the workers are organized and there is therefore no closed shop problem as in America. Unionism in Holland presents the aspect of a house divided against itself, which possibly makes it easier for the manufacturers to deal with their men by playing off one side against the other, but often defeating the legitimate aims of the workers. Strangely enough, the division is largely on religious, rather than economic or political grounds. It is Catholic against Protestant, both against radicals, and neutrals in the middle. Each group has its own organization and leaders and unites only occasionally for the fulfillment of some very special causes.

This division has left the employers free to put their own schemes into effect without much of the opposition generally found in other countries. The most original as well as the most effective of these schemes, used for a time in the Werkspoor, was the inauguration of alternative working weeks during the worst periods of unemployment. It is a provision of the Dutch law, specifically passed to meet the present critical condition, that manufacturers in making necessary cuts in their personnel must pay discharged employees 70 per cent of their wages for a period of three weeks following their dismissal, providing, of course, such workmen have not found other employment in the meantime. Of this the government pays a small proportion out of a special parliamentary unemployment appropriation.

Faced with the necessity of reducing its personnel still further, the Werkspoor last April adopted the scheme of working a certain number of its employees on weekly shifts. All workmen were asked to co-operate, and it was explained that by so doing they would save large numbers of their fellow laborers from being thrown out of work as the exigencies of the situation demanded. As the plan worked out, one shift of men was employed one week at full salary, while the other shift was discharged with 70 per cent of its wages as required by the government. The following week this

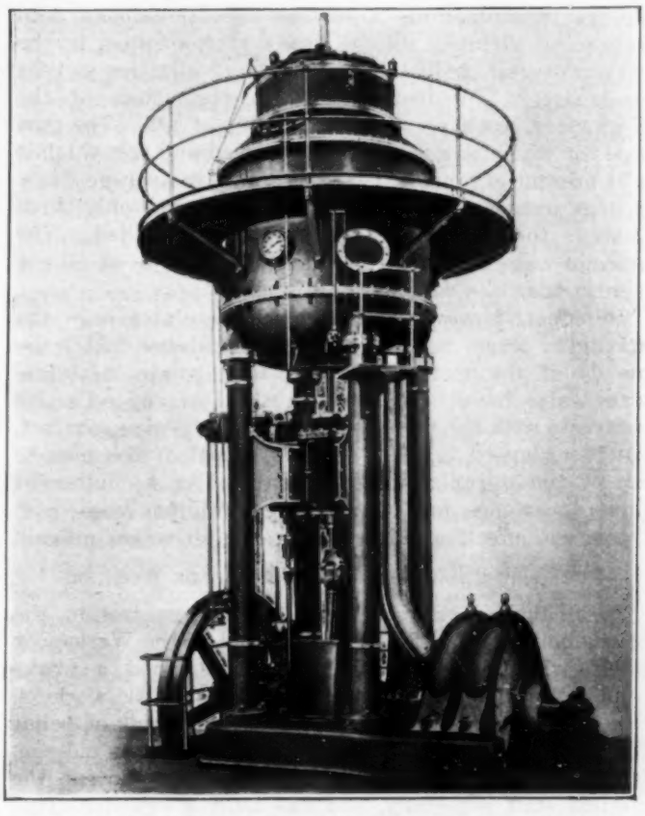


FIG. 4—COMBINED CONDENSER AND PUMPING PLANT FOR SUGAR FACTORIES

last shift was put to work at regular pay while the first shift was temporarily retired. This scheme was not followed with the entire personnel, but only with such as might otherwise have been dismissed in the natural course of events. It was also a way of making the government shoulder part of the expense of preventing unemployment.

What this really amounted to was a further 15 per cent reduction of wages which had previously been reduced in the same proportion following the bursting of the industrial boom in 1920. How the Werkspoor passed this critical period by the adoption of this scheme may be realized by the fact that most of the men thus employed were reinstated on full time within two months, and that the company is now considering making a 5 per cent increase in wages effective Jan. 1, 1923, as a sign of its unflagging optimism.

Economy in Increased Working Week

On the other hand, in return for the promised increase, employers are asking, and in most cases receiving, permission from the government to increase the working week from 48 to 55 hours. The first figure was fixed by the government for various classes of workers, so that in raising the number of working hours factories like the Werkspoor must obtain special concessions from the government for each class. Many men are already working on the increased time, and the rest are expected to follow shortly. As most of the work is by piecework, the men are also the gainers by the change. Machine factories especially hope to effect large economies in the use of coal and in other ways by the new schedule.

The ability of the employers generally to obtain such concessions and to keep the unions, such as they are, within bounds, lies in a well-knit and powerful employers' organization, known as the Metaalbond, and embracing virtually all the heads of companies in the various metal industries. This organization whose headquarters, incidentally, are in the offices of the Werkspoor, has a present membership of 142. The purpose for which it was originally formed and for which it is at present organized, is the fixing of an average wage. In this purpose the organization recognizes only three classes: the skilled, semi-skilled and unskilled. The average wage is fixed by the average income of all the men in the class working on piecework.

In effect, however, this scheme regulates only the maximum wage, acting as a counterbalance to the demands of the men. Attempts to regulate minimum wages also have been made in the form of collective contracts with the workers. The last collective contract, however, lapsed in 1920 on the refusal of the men to accept the organization's standard. As a matter of fact, experience has shown that minimum wage contracts are effective only so long as high wages prevail.

Forms of Relief and Protection for Workers

In all these matters the employers' organization, the Metaalbond, is only following the lead of the Werkspoor itself, which, as early as 1894, established a works council for the submission of grievances by the workers. Since then it has established the usual forms of relief including a sickness fund, a pension scheme, an old age, incapacity and widows' and orphans' benefit, for the clerical staff especially, and has built a "garden city" for the housing of its employees in the Zuilen plant.

Moreover, the Werkspoor seeks to protect its employees, quite as much as itself, against the effects of German competition. The German workingman is more feared in Holland than is the German manufacturer, for the former, with the present rate of exchange, is content to work for very much less than the Dutch laborer can possibly do. In this respect, Holland has been facing a menace similar to our Japanese and Chinese problem of long standing on the west coast of the United States.

The Influx of German Workmen

It is thought by many that, because of its proximity, the similarities of language and, above all, because of its hospitality to the former German emperor, there is something of a sentimental rapprochement between Germany and Holland. Whatever this may have been in the past it is not so now. Both in Amsterdam and Utretcht one may hear complaints that the unemployment situation in Holland has been caused by the tremendous influx of Germans. It has been said, though it is also denied, that there are 60,000 of such Germans in Holland today.

Except in very few instances the Werkspoor has not permitted German workmen to supplant its Dutch employees permanently. Immediately following the war there was a sharp demand for men which the native labor market could not fully supply. To attract workers into the Dutch factories an agent was even sent from Holland into Germany for the sole purpose of issuing labor passports. Many of these Germans are still in Holland today, but they are not working in the Werkspoor factories. A director of the company said that there were probably not more than thirty of them in the employ of the Werkspoor today, and that most of these were such as could not be replaced.

The Werkspoor has thus assumed the position in some degree of a national machine factory and a leader in projects for the extension of Dutch industry in these fields. It is quite improbable that Holland will become a serious competitor in the world machine trade. On the other hand, probably it has no such ambition. In this competition it is, perhaps, too modest, for it has scarcely reached the limits of its possibilities.

Manufacture of Sewing Machines, Cases, and Attachments, 1921

The Department of Commerce announces that according to reports made to the Bureau of the Census the value of products of establishments engaged primarily in the manufacture of sewing machines, cases, and attachments amounted to $35,608,000 in 1921 as compared with $57,938,000 in 1919 and $27,237,000 in 1914, a decrease of 39 per cent from 1919 to 1921, but an increase of 31 per cent for the seven-year period 1914 to 1921.

Of the 36 establishments reporting products valued at $5,000 and over in 1921, 9 were located in New York; 6 in Massachusetts; 4 in Illinois, Indiana and Pennsylvania; 3 in Connecticut; 2 each in Missouri and Ohio; and 1 each in Michigan and New Jersey.

In January, the month of maximum employment, 13,082 wage earners were reported, and in December, the month of minimum employment, 12,275, the minimum representing 94 per cent of the maximum. The average number employed during 1921 was 12,569, as compared with 19,230 in 1919 and 18,007 in 1914.

The Place of Management in Industry

By GEORGE M. VERITY
President, The American Rolling Mill Co.

Responsibilities of management many and varied—Building up of credit—Adoption of policies—Business a source of satisfaction and compensation to management

MANAGEMENT is the keystone in the arch of organization. The responsibilities of management are many and varied. In comparison, Jacob's coat of many colors was a piker as to pieces and colors. Once accepted by any group of men, those responsibilities can never be laid aside day or night, not even for a moment until they are actually assumed by some one else. They present themselves in ever-increasing number, and their disposition is of the most vital importance to stockholders, to directors, to organization, to customers, to creditors, to the community in which a business operates, and to the state and nation.

Credit Is Built Up Slowly

The building up of the credit of a corporation must, like every other living thing that is to endure, be accomplished slowly. It requires more than mere property, plants and inventories to create real credit. Time must elapse to enable the bankers and other creditors of a company to form their own opinions as to the honesty and ability of a management and as to the soundness of their policies. The credit and standing of a company, no matter how strong it may be financially, is something that has to be created and its creation is one of the great responsibilities of management.

The bringing together of groups of men trained in selling, producing, buying, shipping and accounting would be of absolutely no value without a workable scheme of co-ordination.

Management must supply a plan of procedure, a scheme of operation; it must direct and correlate all of the forces of industry.

Management of industry is in fact very much like unto the direction of a great army, constantly facing a strong enemy.

The first duty of management is to plan and to organize to carry on the functions of a particular business. A proper beginning will lead the way toward success. An improper start may spell failure from the very beginning.

Management must adopt policies covering its association with every group it represents. It must make these policies known and, once announced, the hardest task of all is to consistently live up to them so as to win that degree of confidence and good will from every group affected by its actions as is absolutely necessary in the success and upbuilding of any structure that can endure.

Management must demonstrate its ability to be fair to every group interested or affected. It must show a satisfactory result to each group, and over and above all that, it must create reserves of strength in property and plant, in human skill and experience, in markets for products, in customers to consume them, and reserves in earnings and in cash to tide the business over any and every emergency.

Management must know that the problems of purchase, of materials, of production, of selling, of credit, of development, and of financing are being successfully co-ordinated day by day, or, so to speak, a gear in the transmission may be stripped at any moment and the whole machine brought to a standstill.

As organization and production increase, non-productive labor and expense work their way into fixed costs just as easily as poison spreads through the human system when it once gets a start.

Unless all non-productive costs are fought to the bitter end, the growth of a business can easily bring such an avalanche of overhead charges as to fairly swamp the whole proposition.

Personal Interest Submerged

Management in modern corporate life is a trusteeship so complex and so full of responsibility that it must be entirely separated from personal interest. Those connected with management must absolutely forget personal interest, financial or otherwise, and act entirely in the interest of the business as a whole. When that is done intelligently and effectively, each individual interest, be it that of a stockholder, employee, or customer, is certain to be served.

As a business grows, its power for constructive good becomes increasingly great in many directions. Faithfully and properly used, it becomes a great source of satisfaction and of compensation for the many trying hours spent in patient service.

Management knows no hours of labor. Responsibilities cannot be laid aside or left at the store, mill, or office. They follow the individual wherever he goes; they stay with him; awake or asleep, they are omnipresent.

No great enterprise was ever brought to a successful issue without much burning of the midnight oil, without great concentration of mind and body, and without maximum effort.

Physically, mentally and spiritually, the interests of the investor or the worker, the client to be served, and the care and protection of the lives and the property involved, rest in the hands of the management.

Compensation for human effort must, as far as is possible, be in proportion to work done, responsibilities assumed, and results secured.

From an address prepared for the Spring Meeting of the National Conference of Business Paper Editors.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

Device for Demonstrating the Screw

BY FRED J. ATZROTT

The device illustrated herewith was made by the students at the Seneca Vocational School, Buffalo, N. Y., and is used for demonstrating the screw.

The base is made of cold-drawn steel ½ in thick, 2 in. wide and 8 in. long. The sides are ½ in. thick, 2 in. wide and 2½ in. high, and the top is shaped to a 45 degree

DEMONSTRATING DEVICE AND SAMPLE SCREWS

angle. The cross bar, which is cold-drawn steel ⅛ in. thick, and ⅜ in. wide, is fastened to the side with round head machine screws. The celluloid scale is attached to the cross bar and is readily visible at the angle at which it is set. The slide moves freely which is absolutely essential.

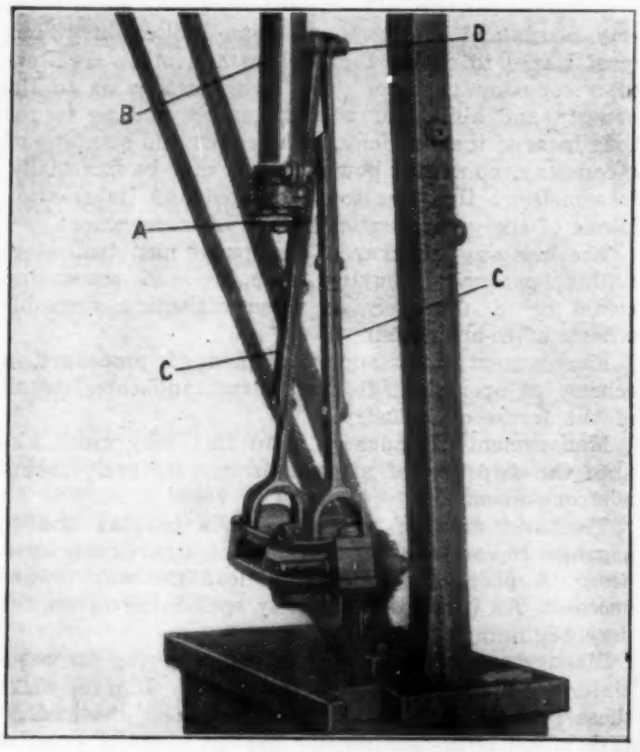
The illustration also shows some of the different types of screws which are made to ¾ in. diameter and 6 in. long, among which are the U. S. S., sharp V, and square forms of threads and comprising single, double, triple and quadruple threads. One of the screws is cut to 40 threads per inch and the nut is graduated with twenty-five marks around the circumference. This screw and nut are used to demonstrate the micrometer caliper.

The practical application of this device aids the instructor in conveying to the students a knowledge of the different kinds of screws and the terms used in defining their characteristics. After a practical demonstration by the instructor, the student is given a trial card and certain screws. He then determines the number of threads per inch, the lead, the pitch, whether the screws are of a single, double, triple or quadruple threads. He also names the type or form of thread.

Home-Made Machine for Grinding Links —Discussion

BY E. A. THANTON

In reading the article under the above title by Matthew Harris on page 84, Vol. 58 of the *American Machinist*, it occurred to me that the machine used in our shop has some advantages over the one he describes. As shown in the accompanying illustration our machine was built for grinding links and nothing else. For this reason it was possible to build a more compact machine and one that takes up very little space. The grinding-



HOME-MADE MACHINE FOR GRINDING LINKS

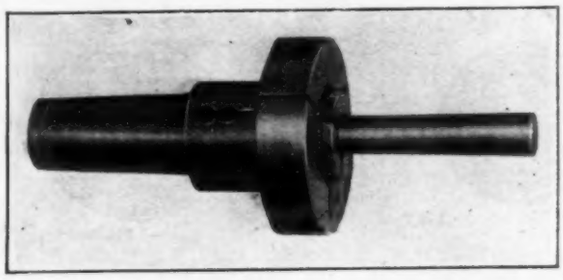
wheel spindle is held in a special bracket bolted solidly to a heavy bench, as shown. It is run by means of a belt from an overhead countershaft. Vertical adjustment of the link carrier is made by means of the handwheel *A*, which turns a screw in the slotted pipe *B*, suspended from the ceiling. The swinging radius arms *C*,

are pivoted at *D* to a stud which slides in the slot in pipe *B* and is attached to the nut on the screw operated by the handwheel *A*. A flat plate is bolted to the spindle bracket for the side of the link to rest against as it is swung back and forth in grinding. This plate prevents side twist of the radius arms while grinding.

An Expanding Chuck—Discussion

BY EDGAR ALLEN

The article by C. J. Priebe on page 232, Vol. 58, of the *American Machinist* describing an expanding chuck, brought to mind a very simple form of such chuck. As shown in the illustration, the chuck consists of a steel, or even a cast-iron, body, the shank of which is turned



AN EXPANDING CHUCK

to fit the taper bore of the lathe spindle in which it is to be used. The shank is inserted in the lathe spindle and the center hole drilled and taper bored to receive the hardened taper expanding-pin, shown partly inserted. The outer end of the shank is next turned and then it is removed, cross drilled for the ends of the slots and three slots cut in it to allow for expansion. Split rings, like the one shown in place, are made to fit the bore of the work to be held by the chuck. These rings usually have a shoulder at the back around which a rubber band or coil spring is placed to hold them to the end of the chuck while placing the work. A slight tap with a hammer on the end of the taper expanding-pin will securely lock the work in place after it is put over the split ring. A small rod run through the lathe spindle from the back is used to knock out the expanding pin and release the work. Pulleys, gear blanks, bushings and all sorts of parts may be held on this chuck, and its range of accuracy and usefulness, when well made, is surprising.

Making Piston-Rings Round

BY E. V. ALLEN

Most people who have made piston rings know that after the slit has been cut and the ends pressed together that the rings will not be round. The cut ends always have a tendency to "stick up" no matter whether the ring is of the eccentric type or not. The kind we make are the same thickness all the way around and the ends would be especially troublesome if not remedied. So after being split, and before the final grinding, the ends of the rings are bent inward in the fixture shown. The operator simply places one end of a ring between two of the pins of the fixture and swings the ring around so as to bend the end inward. If he bends the end too much he places it between the two pins nearest him and springs the end outward slightly. The fixture is made

MAKING PISTON-RINGS ROUND

so the operator can do most of the bending with his right hand, and when he has bent one end of the ring the amount he thinks is enough he turns the ring over and bends the other end in the same way. A ring gage is available but an operator soon becomes expert enough to get the rings round without gaging them. The pins themselves are not adjustable with relation to each other, but all three are carried on a slide which may be adjusted so that the workman can set it for rings of different diameter with relation to the edge of the iron plate, making it easier for him to handle the rings and gage the correct amount of bend with his eye.

Chasing a Nut Without an Engine Lathe

BY R. B. WARE

The nut in the tail spindle of my bench lathe was in bad order and steadily becoming worse, both by reason of ordinary wear and because every once in a while some curious kid would come along, run the spindle clear off the screw, and then becoming scared for fear he had done some irreparable mischief, would try to put it back again. Before he would get caught at it he would have broken out another turn or two from the thread of the babbitt nut.

I had no tap of the proper size and lead, and no engine lathe in which to chase a thread, but I just *had* to have a new nut for that spindle, and the drawing shows the way I made it. As the trick may help out some other reader of the *American Machinist*, I am passing it along.

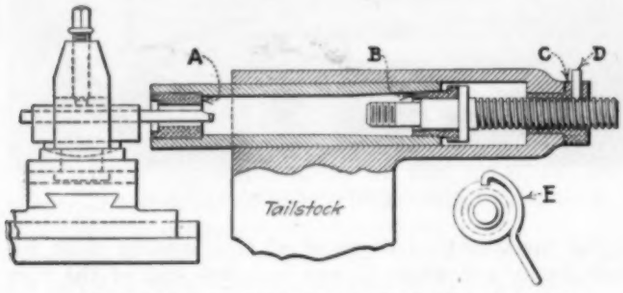
I first made the bronze bushing *A* for the new nut, and drove it into the recess provided for it in the back end of the spindle. I next made the bushing *B*, bored to fit tightly on the shoulder of the screw where the handwheel belongs and tapered outside to fit the center-hole of the spindle. A third bushing, *C*, was bored to a running fit on the threaded portion of the screw and turned to a drive fit in the end of the barrel of the tailstock.

Bushing *B*, which had first been split with a hacksaw, was then placed loosely in the center-hole of the spindle and the shouldered end of the screw inserted in the bushing, when a smart blow with a lead hammer upon the outer end of the screw served to drive the bushing tightly into the hole and at the same time to clamp it firmly upon the shoulder of the screw, binding the three pieces together as one.

The spindle was then placed wrong end first in the barrel of the tailstock (from which the locating key had been removed) with the screw projecting through the bushing *C* at the rear end. A pin, *D*, with the end

flatted off to fit in the square thread of the screw, served nicely as a temporary nut to give me the lead. A spanner, *E*, made to hook into the spline of the spindle, provided the means of rotating it.

I had counterbored the outer end of the bronze nut for a short distance to a diameter 0.002 in. over that of the screw, for the purpose of indicating when the



NOVEL WAY OF CHASING A THREAD IN A NUT

thread had been cut deep enough. A square-thread tool, ground to the required width of thread, was placed in the tool post of the slide-rest, only the cross movement of which was used and that only for the purpose of feeding in the tool for the successive cuts.

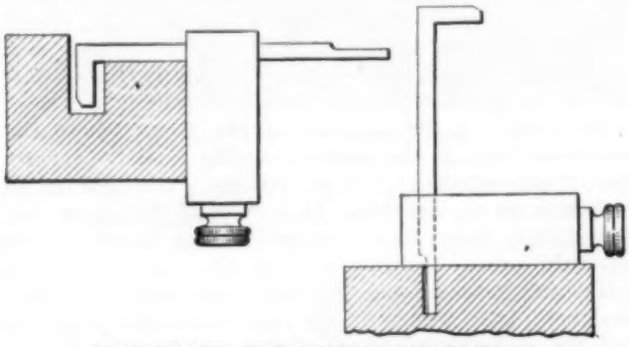
The manner of cutting the thread, by turning the spindle with the spanner until the tool had passed through the nut, withdrawing the tool and screwing the spindle back in again by hand—and repeat, indefinitely—is perfectly obvious from the drawing. Though it was somewhat tedious, it produced an excellent nut and had the advantage of requiring no other machine than the lathe itself and no parts that were not made on the same lathe preparatory to the work.

Useful Blade for Diemaker's Square

BY G. W. NUSBAUM

The diemaker's square, which is to be found in the tool kit of most good mechanics, can be made more useful by the addition of such a blade as is shown in the accompanying sketch.

This blade can be used for determining the depth



THIN BLADE FOR DIEMAKER'S SQUARE

of holes too small for the narrowest blade furnished by the makers of the tool. The hooked end will facilitate accurate machining or filing for duplication of parts having a shoulder of such character that insufficient space is available for measurement with micrometers, or, if the angle is accurately made, it will also serve the purpose of a double square.

Valve Grinding—Continuous or Reciprocating—Discussion

BY RICHARD H. KIDDLE

In reply to an article under the above title by H. R. Fowler on page 1,006, Vol. 57, of the *American Machinist*, it seems to me that the proper way would be to revolve the valve all the way around in preference to part way. In Fig. 1, *A* shows the continuous rings made by complete revolutions, while *B* shows the broken rings due to the other method.

I think valve grinding is often over done. If the seat is good to begin with, a very little grinding is best. Valves are often ground when they should be machined.

When making or fitting in new piston rings, I bevel the edges of the rings, as exaggerated in Fig. 2. A

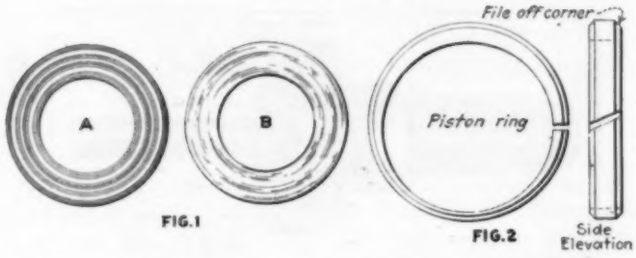


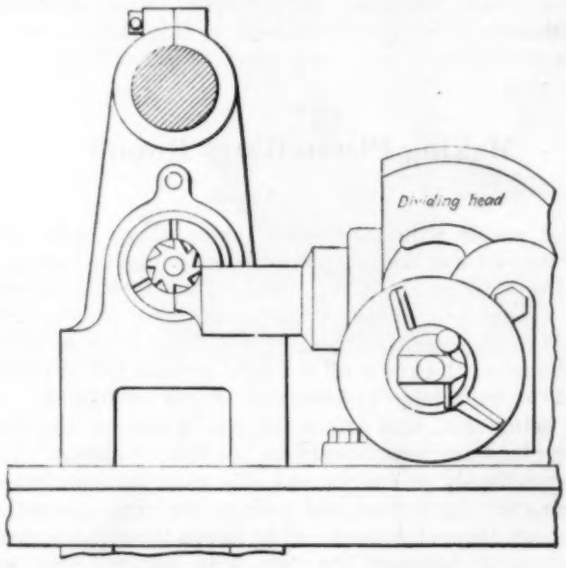
FIG. 1—CONTINUOUS OR INTERMITTENT GRINDING
FIG. 2—BEVELED EDGES OF PISTON RING

ring that has sharp edges tends to push the oil with the ring. With the edges beveled, there is a little room for oil and no appreciable wearing surface is taken from the ring.

Making a Radius End-Mill

BY ATOL MAKER.

The quickest and most accurate method of making a radius end mill is shown in the accompanying sketch. The blank is brought to the proper position and revolved by means of the dividing head. The teeth can be milled while the piece is set up. The cutter used in making the radius end-mill naturally produces an accurate radius of one half its diameter. The merits of this method are so apparent that no further comment should be required.



METHOD OF MAKING A RADIUS END-MILL

Inspection Gages for Crankcases

By Herbert F. Crawford

The three crank case inspection gages shown herewith are from the Pierce-Arrow Motor Car Company's plant, Buffalo, N. Y., and give an idea as to its inspection methods on this important motor part. The first gage, Fig. 1, is for inspecting the clearances for the front motor support and is built up principally of ½-in.

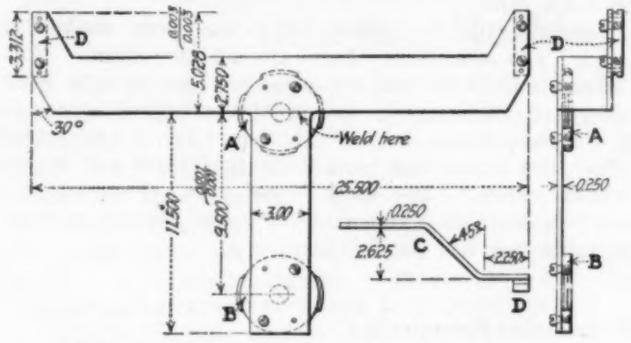


FIG. 1—PLATE GAGE FOR FRONT MOTOR-SUPPORT CLEARANCE

steel plate of two widths, 2¾ and 3 in. The gage has the general form of a letter T, and is located horizontally on the crank case by the disks *A* and *B*, which fit the first and third cylinder openings. The two arms are bent down at the ends on a 45-deg. angle as shown at *C*, and carry steel gaging blocks *D*, which show the proper relation between the supports and the cylinder face. The flat plates are located with relation to each other by means of both screws and dowels in the disk *A* and the joint is also welded as indicated by the note in Fig. 1.

For gaging the height of the crank case a T-shaped micrometer gage is used, as shown in Fig. 2. This gage has a cast iron frame *A* 1 in. wide and 14 in. long at the base, which carries two hardened and ground blocks *B* and *C*, making contact with the underside of the crank case. The arm *A* of the gage has a projection on its upper end which is bored to fit the barrel of a Brown and Sharpe micrometer, as shown. When the gage is assembled the plates *B* and *C* are ground so as

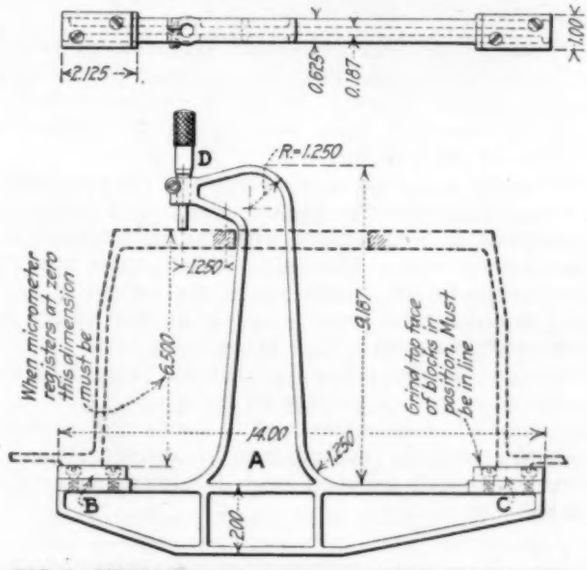


FIG. 2—MICROMETER GAGE FOR HEIGHT OF CASE

to be in line, and also so the distance between the tops of the blocks and the end of the micrometer screw must be 6.5 in. when the micrometer reads zero. As will be seen from the illustration, no tolerance is allowed on this dimension. Principal dimensions are given simply as a guide which may aid in adapting the gage for other uses.

The crankcase gage shown in Fig. 3 is for testing

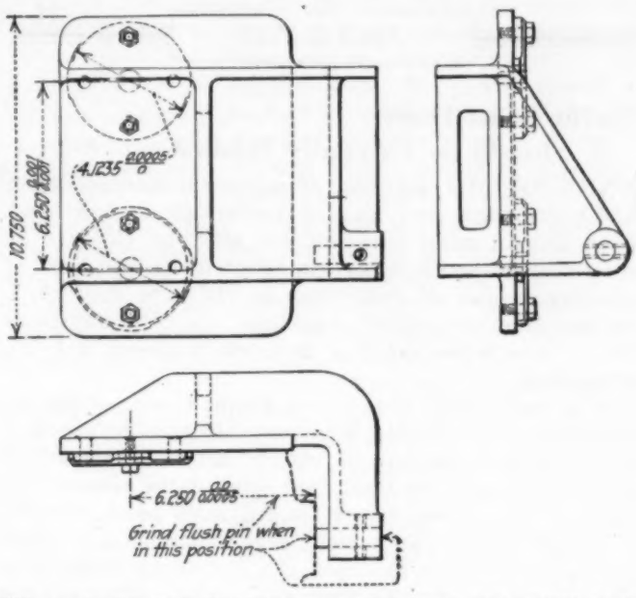


FIG. 3—GAGE FOR TESTING LOCATION OF AIR PUMP PAD

the location of the face of the air-pump pad on the side of the crankcase. The fixture is located by two disks fitting in the cylinder holes. The arm which extends down over the side of the case carries a gaging pin which is ground flush with the outside when the end is in the proper position. Gaging by pins of this type can be done with surprising accuracy as very minute difference can be detected by the feel.

Removing Broken Studs—Discussion

By C. W. Davey

Though I have no doubt that the method outlined by E. Lytton Brooks on page 273 of the *American Machinist* will in most cases remove broken studs and setscrews, it has one drawback in that the driving of a squared piece of tool steel into a hole slightly smaller than itself will naturally tend to swell the broken stud or screw and, if this is already a tight fit in the first place, it will obviously be still tighter after the driving.

The writer finds that a left hand tap of suitable size will do the trick in jig time and, though he has taken out many such screws in this way, not one has been injured. Occasionally one has to resort to some rust loosening method and, of course, a little judgment has to be used but the method has never failed in the writer's experience and in no case has the broken screw appeared to be exceptionally tight, due to the tap actually cutting its own way to a point where the effort necessary to remove the broken screw is less than that required to further advance the tap.

In the case of studs or screws having a left hand thread, a right hand tap can be used in the same manner.

American Machinist
Established 1877
KENNETH H. CONDIT AND FRED H. COLVIN
Editors

April 5, 1923

Pacific Coast Trade Should Be Carefully Studied

ONE OF THE essentials of successful merchandising is to study your market, preferably at first hand. With this in mind many of our machine builders go abroad or to South American countries in the hope of building up, or of rebuilding as the case may be, a foreign market for their machines. In too many cases this is done while excellent domestic business is being overlooked.

It is particularly true of the Pacific Coast. While no statistics are available it is probably safe to say that more machine builders of various kinds have traveled in foreign countries than have studied the shop conditions of the Pacific Coast from a sales point of view.

Men of the east who visit large shops such as those in the automotive field get the erroneous impression that these are typical American shops. They do not realize that they are the exception and that the greater majority of shops, even in the east, employ less than fifty men. In the newer sections of the country the large shop is, of necessity, the exception.

If anyone infers from this, however, that the business of the Pacific Coast is not worth looking after, he is sadly mistaken. For although the shops are comparatively small they are often equipped with more modern machines than many eastern shops. Shops which handle automobile repairs are good examples. Cylinder grinding machines and similar equipment are the rule rather than the exception.

Just what the total sales of machine tools on the Pacific Coast may be, is difficult to say. But a careful survey of the situation, reinforced by the opinion of men who are in a position to estimate very closely, places the total machine-tool business of the Pacific Coast at five million dollars, in round numbers. This is to all appearances, a higher sale per capita than in any other section of the country, if we except a few such automotive centers as Detroit and Cleveland.

We Have Helped Ourselves By Helping the Patent Office

WE ARE glad to be able to say that the Sterling-Lehlbach Bill for the Reclassification of Governmental Salaries became a law on March 4. It was a bill that the *American Machinist* approved of and which it asked its readers to support. The results have been gratifying.

Due to this new law the salaries of primary examiners in the patent office will be $5,000, enough to attract high-class men to these important positions.

Passage of the Sterling-Lehlbach Bill was urged by individuals, manufacturers and societies, including that large body, the Federated American Engineering Societies. The successful outcome is an indication of what a determined group can do toward influencing legislation, and will encourage many to respond to future appeals that may be made for active support of desirable bills.

Progress in the patent office has been made but slowly, yet conditions there are on the mend. Far-sighted individuals and organizations have been at work for years educating the people of the United States as to the importance, in fact the necessity, of the patent office, and explaining conditions that were not known or not realized. The work is not over. Your support will be asked again and with the recent success in mind no doubt you will not fail to give it.

Industrial Research and What It Involves

WITH THE return of easier days for our big industrial plants there will probably come renewed interest in research by reason of the possibility of securing the needed appropriations. But few, even of our strongest corporations, are really awake to what real research means and the compensation it holds out to the persevering scientist and the company with faith enough to back him.

A few days ago we had the pleasure of listening to one of the leading research men of the General Electric Company as he told a group of engineering students of the disappointments and rewards of industrial research. His listeners followed him with close attention, and with good reason, for what he said might well have given many a hardboiled corporation official food for thought.

There are not many commercial organizations in this or any other country with sufficient vision to support a research chemist or physicist for three years without having him produce a single useful bit of information. In this case, however, the patient investigations of those three years finally led up to the gas-filled incandescent lamp.

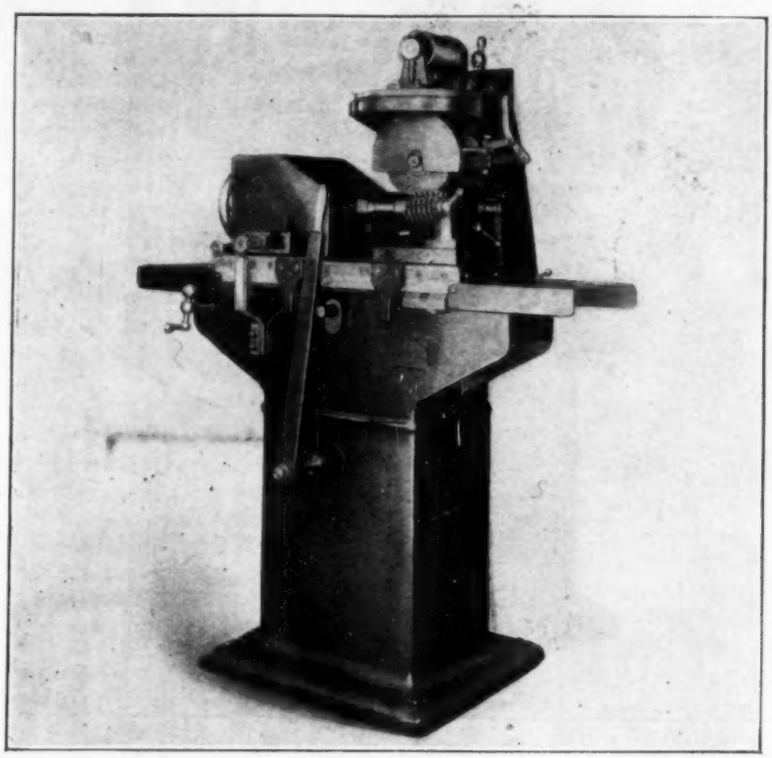
Of course the pure scientific research carried on in this particular laboratory is supported by the actual tangible results obtained by the much larger staff of industrial research men working on the production problems of the company.

Perhaps it is not too wide a stretch of the imagination to compare the General Electric Company's investment in research at Schenectady with the investments of a keen business man. The bulk of his surplus goes into bonds or preferred stocks where the return is pretty well assured but he keeps a certain amount to put into common stocks which may bring no return for some months or years but when they do come through produce results all out of proportion to their cost. The industrial research men correspond to bonds and preferred stock, the scientific research men to common stock. Investment in such common stock is always an excellent gamble.

Shop Equipment News

Harris No. 5 Semi-Automatic Hob Grinding Machine

A hob grinding machine that is smaller in size but similar in construction to the one described on page 502, Vol. 57, of *American Machinist*, has recently been developed by the Harris Engineering Co., Bridgeport, Conn. The machine, which is illustrated herewith, is designed to take care of hobs with both straight and right- and left-handed helical flutes, and not over 4 in. in diameter and 5 in. in length.



HARRIS NO. 5 SEMI-AUTOMATIC HOB GRINDING MACHINE

The hob is carried on an arbor having a taper shank and fitting into the work carrying spindle. The outer end of the work is supported by a center in an adjustable tailstock. The work-holding members are mounted on a table that is operated by means of a hand lever in front of the machine, so that the work can be moved back and forth across the face of the grinding wheel. The table travels on ball bearings and it is claimed that the movement is so sensitive that the operator's hand can feel whether a light or heavy cut is being made. All working parts are covered to protect them from grit and dust.

Hobs having helical flutes are rotated by means of a lever, pivoted in the center and with ball bearings at each end, that is connected to the work spindle by a steel tape wound upon a drum. By changing the angle at which the lever operates, different helix angles can be obtained on the work, during the travel of the table.

Double index plates are provided, one of which is used for indexing and the other for escapement. The escapement plate takes all the wear so that the indexing plate remains accurate. The indexing mechanism is semi-automatic and can be operated only at the end of the return stroke.

The grinding wheel spindle is driven by a belt without twists, turns or idler pulleys. A 7 in. diameter wheel is the maximum that can be used. The wheelhead and column are so constructed that the center of the wheel swivel is over the center line of the table. The wheel spindle is carried in bronze dust-proof bearings provided with lubrication from an oil well and a means of taking up thrust and wear.

A diamond truing device is an important feature of the machine. It is built into the head, is always in position and may be used when the machine is in operation, without disturbing the work.

The machine may be set to grind undercut hobs or cutters, and to give them top rake as well as to grind the faces of the teeth radial. The feed of the hob against the grinding wheel is rotative and is obtained through a small handwheel which the operator turns with his left hand after each complete revolution of the hob on the work spindle.

Either a countershaft drive or individual motor drive is provided. When motor driven, the motor is mounted on top of the machine and is provided with a pedestal to take up belt slack. The machine is usually equipped for dry grinding, but may also be provided with pumping equipment for wet grinding.

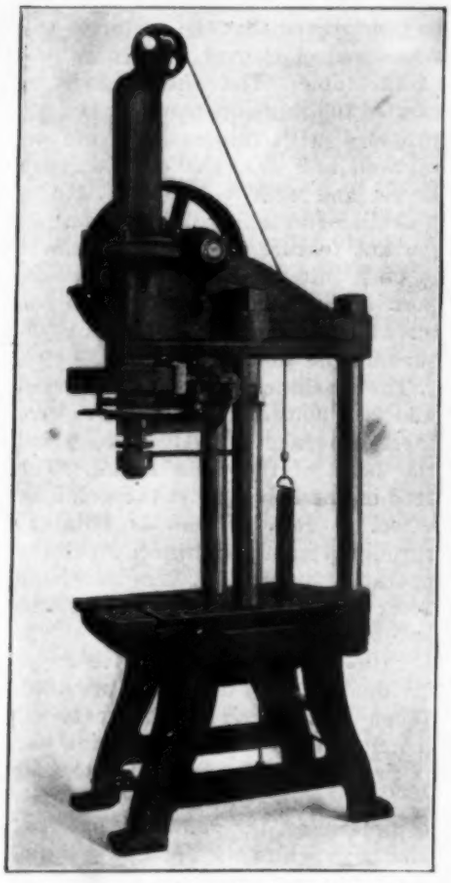
General Manufacturing Co. 20-Ton Flexible Power Press

A flexible power press and straightening machine has recently been devised by the General Manufacturing Co., Detroit, Mich., that is similar in principle to the machine described on page 867, Vol. 56, of *American Machinist*, but heavier in construction. The machine, as the name implies, is flexible in its operation, being capable of pressures varying from a few pounds up to 20 tons. It is intended as a single-purpose heavy-duty machine.

The press is a three-post machine, as shown in the illustration herewith, mounted on a base with the table 30 in. from the floor. The table is 22 in. wide, is provided with a ¾-in. T-slot 6 in. from the front of the table by means of which fixtures may be clamped, and it has a 4-in. claw-

foot hole. A working surface of 18 in. is provided between the columns and the front of the table.

Power is supplied to the 24x6 in. pulley by belt and then through a worm drive and spline key, which drives the ram in one direction at a constant speed. The nut revolves



GENERAL MANUFACTURING CO.
FLEXIBLE POWER PRESS

with the ram until pressure is applied by means of a pedal. The pressure tightens the brake to stop the nut, and the ram passes down through the latter until the pressure on the pedal is released. The return stroke is obtained by means of a spring connected by a cable to the top of the ram.

The maximum stroke of the ram is 12 in. and the greatest opening between the table top and the end of the nose of the ram is 18 in. on standard machines. Larger openings, however, can be had by the use of special length posts that will give the desired height without changing either head, table or legs. The speed of travel of the ram depends on the speed of the pulley. For example, with the pulley running at 300 r.p.m., the down travel of the ram will be 120 in. per min. The machine occupies a floor space of 32x45 in. and has an overall height of 110 inches.

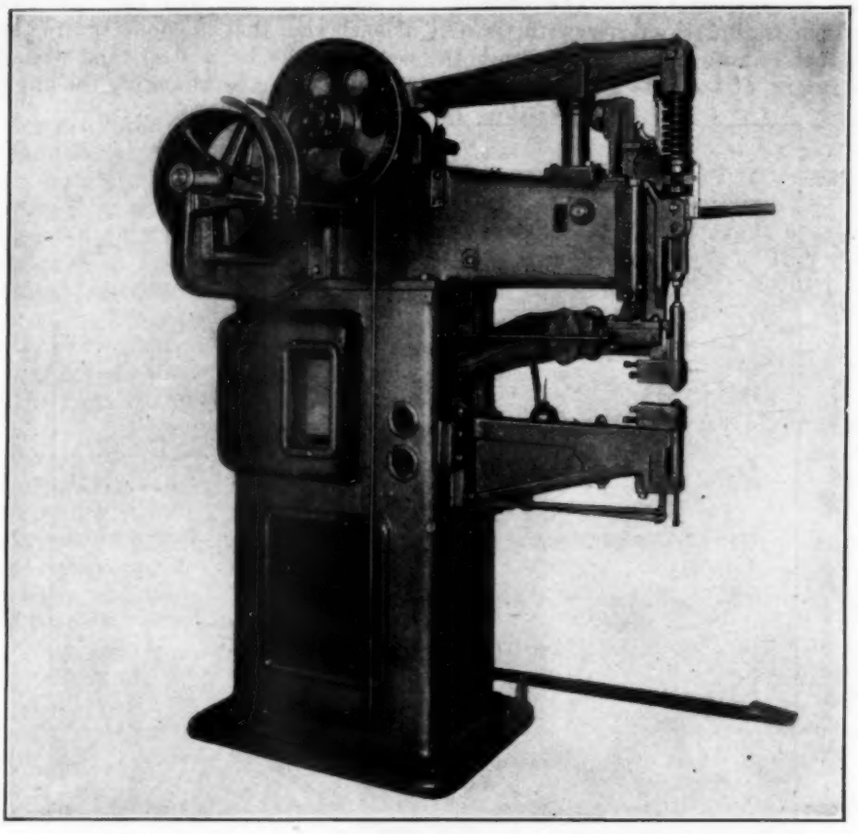
Thomson No. 75 Power Automatic Electric Spot Welding Machine

The Thomson Spot Welder Co., 161 Pleasant St., Lynn, Mass., has recently marketed a power-driven automatic spot welding machine for work such as on disk wheels, crankcases and similar heavy pieces. Its normal capacity is two $\frac{5}{16}$ in. iron or steel plates, but it will stand an overload up to $\frac{1}{2}$ in. thickness of metal. The normal and overload capacities for welding brass plates are, respectively, two $\frac{3}{8}$-in. and two $\frac{1}{2}$-in. plates.

The machine, as can be seen from the accompanying illustration, is provided with a pressure spring that provides a maximum pressure of 2,000 lb. per square inch on the die points. The dies or electrodes are of large diameter and have water-cooled die-blocks. The throat depth is 2 ft. A drop horn is not regularly provided with this model of welding machine, but may be supplied.

A special hand lever, which elevates the upper welding head or electrodes $1\frac{3}{4}$ in. in addition to the $\frac{3}{4}$ in. normal opening of the electrodes, making a total maximum opening of $2\frac{1}{2}$ in., is provided to facilitate the insertion or removal of work having flanges, ribs or angles. The welding machine is also provided with a trip clutch worked by a pedal, and it may be operated in cycles of one spot or continuously.

Automatic make - and - break switches are provided which operate in conjunction with a contactor panel. These mechanisms can be set to suit the gage of stock being welded or the amount of indentation desired or allowed. The cut-outs and the cam mechanism are entirely automatic, the operator's only duty being to place the work properly between the dies or electrodes and to depress the pedal.



THOMSON NO. 75 P. A. ELECTRIC SPOT WELDING MACHINE

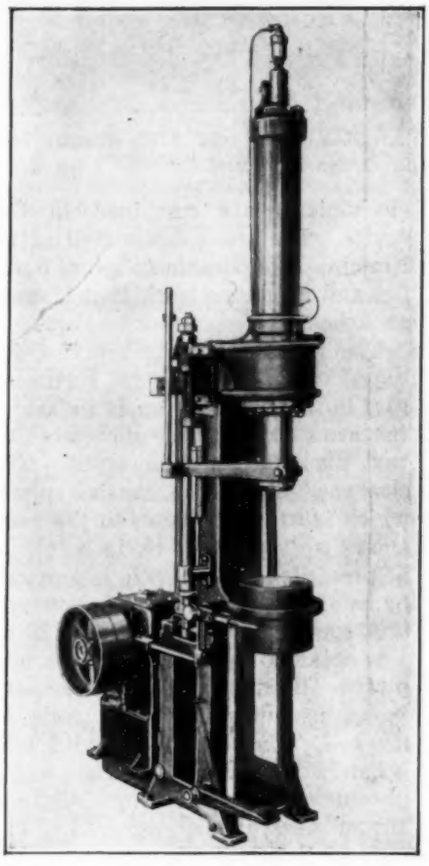
The driving pulley is 15 in. in diameter, requires a 3-in. belt and is run at a normal speed of from 94 to 100 r.p.m. to operate the machine at the rate of 20 spots per minute.

The welding machine has an electric capacity of 100 kva. and 75 kw. at 75 per cent power factor. It can be built for from 25 to 60 cycles frequency and can have any primary voltage from 110 to 550 volts. The whole unit occupies a floor space of $67\frac{1}{2}$x$29\frac{1}{2}$ in., has an overall height of 81 in. and a gross weight of 4,200 pounds.

Oilgear Gooseneck Vertical Broaching and Assembling Press

The latest addition to the line of products of the Oilgear Co., Milwaukee, Wis., is the "gooseneck" vertical broaching and assembling press. The machine, a general view of which is shown herewith, is operated hydraulically and is claimed to have a flexible control and steady push that makes is suitable for broaching and for such assemblying as pushing in bushings. In its operating characteristics, it is similar to the horizontal press described on page 390, Vol. 57 of the *American Machinist*, and it employs an Oilgear variable delivery pump such as described on pages 271 and 395, Vol. 55.

The ram speed can be controlled either automatically or manually at any point in the stroke. The speed



OILGEAR GOOSENECK VERTICAL BROACHING PRESS

changes are said to take place without jar or shock and without overloading the machine. The ram movements are controlled automatically by means of an arrangement of adjustable trips and tappets. An arm is carried on the ram on which is mounted a rod which has two adjustable trips. As the ram moves down, each trip releases a tappet and permits a control rod to be moved by a helical spring.

The usual operating cycle is as follows: The ram is started downward by pressing down on either a hand or foot lever. When the lever is at its lowest position the ram advances at its maximum speed. At the point where the ram is about to begin its working stroke, a trip releases one of the tappets and slows the ram down to the press speed. At the end of the working stroke the second trip releases the other tappet and thereby reverses the ram and returns it to the starting position at maximum speed. A collar on the trip rod then engages with a stop on the control rod and automatically stops the ram in the starting position, ready for the next cycle. Each new cycle is started manually by the operator.

By changing the position of the trips, the lengths of the rapid advance stroke and of the working stroke can be regulated. When one trip is omitted the entire movement is a working stroke. The speed of the ram may be varied at will and the ram stopped if necessary at any position by means of the manual control lever.

The press is self-contained and requires no accumulator nor outside pressure system. The variable delivery pump can be driven from any constant source of power and supplies a steady flow of oil, the amount of which depends on the length of the pump stroke.

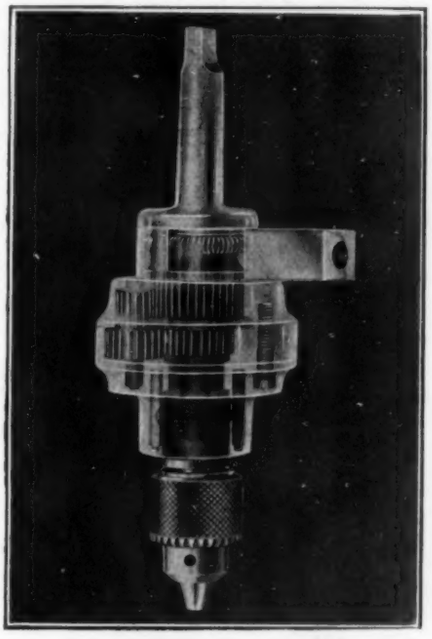
Because of the high speed available and the automatic control features, the manufacturer claims that the machine gives high production. It is said that a press installed in an automobile shop turned out from 600 to 650 pieces per day of 9 hours when broaching a 1 in. square hole in a windshield post. Two broaches were used.

The machine is built in four sizes: 3½, 6, 10 and 14 tons. Each size has a maximum stroke of 18 in., a throat depth of 8 in., a work height of 19½ in., an overall height of 7 ft. 2 in. and a hole 7 in. in diameter in the table, which is 35½ in. from the floor. A 7½-hp. motor is recommended to run the pump at 600 r.p.m. The ram diameters vary from 2⅜ to 4¾ in. in the different machines, and the maximum ram speeds from 36 to 9 ft. downward and 90 to 23 ft. upward.

Jarvis Sensitive High-Speed Tapping Device

The Geometric Tool Co., New Haven, Conn., has recently placed on the market the Jarvis sensitive high-speed tapping device that is shown herewith. The device is intended for light work using high speeds, and its construction is such as to minimize the breakage of taps.

The body of the tapping machine is of aluminum and weighs a little



JARVIS SENSITIVE HIGH-SPEED TAPPING DEVICE

less than 2 lbs. The chuck spindle is of hardened tool steel. To prevent the breaking of taps at the instant of reversal, the machine is fitted with a shock absorber which acts on the reverse gears. The shock is ordinarily great at the instant of impact when the spindle is running at, say, 2,000 r.p.m. forward and the chuck is suddenly made to run at 4,000 r.p.m. in the reverse direction. With the aid of the shock absorber, the impact is reduced and the average life of taps is increased.

The tapping device is made in two styles. Style OA has a positive ball drive and is intended for high-speed work when tapping through the piece. Style OAN has a cone friction drive with ball reverse. It is devised for high-speed work in blind holes or tough tapping, especially on very light, small work. Both styles are equipped with shock absorbers on the reverse and their capacities are ⅜ in. or smaller. They can be equipped with Nos. 1 or 2 Morse taper shanks.

Turner "Master" Gasoline Blow Torch

The latest addition to the line of liquid-fuel heating devices of the Turner Brass Works, Sycamore, Ill., is the No. 44A "Master" blow torch. The torch, shown in the accompanying illustration, has a number of special features, such as a safety valve, only one opening in the tank, two sources of air supply and the separation of the shut-off valve from the fuel-control valve. The sectioned portions of the torch in the illustration show the construction of some of the vital parts.

The safety valve is located at the

TURNER "MASTER" GASOLINE BLOW TORCH

end of the horizontal pump cylinder and is fitted with a diaphragm that gives way automatically at 40 lbs. air pressure.

The pump on the torch is equipped with a leather on the piston that spreads like a parachute during the working stroke and closes on the return stroke.

The fuel, in its journey from the tank to the combustion chamber, passes through the interior of a solid bronze baffle called the "hot spot hump." The baffle is located near the outlet of the burner tube, in the path of the flame. It becomes hot quickly and its heat vaporizes the fuel into a hot, dry, highly inflammable gas.

Air is admitted into the torches from two sources. One is through a flared inlet in front of the needle valve. The other is through a long shot at the top of the burner tube and just above the hot spot hump.

To prevent the enlarging of the fuel orifice, the shut-off valve has been separated from the fuel-control valve, the latter being placed above the shut-off. The needle valve is provided with a thumb and finger control so as to prevent the operator from exerting enough pressure to enlarge the orifice.

The torch is built in a variety of sizes and types for various purposes. All are provided with large wooden pistol-grip handles and removable soldering iron hooks.

Slocomb Inside Micrometer

The accompanying illustration shows a 3 to 4 in. inside micrometer provided with an auxilary cap which is used when measuring diameters of larger size than the plain micrometer can handle. The device has recently been marketed by the J. T. Slocomb Co., Providence, R. I. The general construction of the tool is similar to that employed on the regular Slocomb line of outside and inside micrometers. The spindle is tool steel.

The feature of the tool is that it cannot be put out of adjustment by careless handling, because it must be taken apart to make adjustments. If it is desired to adjust the micrometer, the removable cap must be taken off, the screw which holds the tension spring in place taken out, and the thimble and screw removed. Then it is possible to adjust the device for wear by turning the large nut with a spanner wrench that is provided. The micrometer can be locked with a binding screw to preserve the setting.

Three sizes of the micrometer are available, 3 to 4 in., 4 to 5 in. and 5 to 6 in. The 3 to 4 in. size has two hardened and ground caps, the first giving a range of 3 to 3½ in. and the second a range of 3½ to 4 in. This tool has only a ½ in. movement of the screw. The other two differ in that they have a screw movement of 1 in. Each micrometer can be provided with elongated caps to measure internal diameters larger than specified on the tool.

Kimkin Rack and Screw Hand Press

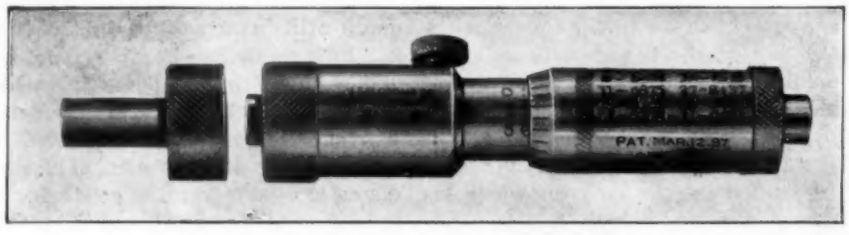
The feature of a hand-operated arbor press recently brought out by Kimmerle Bros., 683 Golden Gate Ave., San Francisco, Calif., is that both rack and pinion and screw

KIMKIN RACK AND SCREW HAND PRESS

mechanisms are combined in the device. The press, designated as the Kimkin, is applicable to gear, bushing and armature work that is done on a bench.

The frame and base are cast integral in order to prevent spring or give in the press. Being 16 in. apart, the arms of the frame allow work of that diameter to be inserted. The clearance above the surface plate, which is at right angles to the ram, allows work up to 16 in. in height to be pressed. A 10-in. hole is provided by removal of the surface plate.

A speed and power ratio of 26 to 1 is obtained by using the rack and pinion. By using the screw, greater power is obtained, with a ratio of 980 to 1. The screw is provided with a handwheel having a ratchet and a phosphor-bronze bushing. A ball thrust bearing is employed. The ram is 2 in. in diameter and has threads of 6 pitch. Weight, 200 lb.



SLOCOMB INSIDE MICROMETER

News Section

Steel Prices May Go Higher In Chicago

Higher prices for warehouse steel are expected in the Chicago steel trade due to recent mill advances and the acute shortage of some material, particularly structurals. Warehouse prices have not been adjusted since the recent advances in finished steel and sheets. An announcement of this kind is expected at any time.

Neither the leading independent or the leading interest in this territory is booking tonnages for third quarter shipment, but it is practically certain that some of the orders already taken cannot be delivered before July or possibly August. Operations of mills are holding up well in this district but further increases are not likely, due to a shortage of fuel and labor.

The Inland Steel Co. has not opened its books for the third quarter and will continue to divide its tonnage among its customers as fairly as possible. Sheets prices are firm and unchanged.

A fair quantity of inquiries are being received and sales continue in fair volume. The railroads and automobile industry are doing practically all of the buying.

Rail Earnings in February

Railroad earnings during February on most of the Class 1 railroads were less than that reported for January, but greater than the same month last year. Considering that February was a short month and that the weather was unfavorable to transportation, little significance is placed upon the slight decline. Gross operating revenues on forty-eight railroads handling approximately three-fourths of the country's business show increases of about 11.2 per cent as compared with February of 1922. The return based upon tentative value is equal to 4.57 per cent. In January the percentage equaled 5.54 per cent.

Foundrymen Tell Plans for Entertainment

Tentative plans for the entertainment of visitors at the Cleveland convention of the American Foundrymen's association and related organizations, April 28 to May 3 are nearing completion. At the same time the Metals Division of the American Institute of Mining and Metallurgical Engineers, the American Malleable Castings Association and the Foundry Equipment Manufacturers Association will hold their several meetings and in consequence over 4,000 delegates and visitors are expected in the city. A local committee composed of foundrymen, equipment manufacturers and supply producers has charge of the arrangements for special entertainment features.

A ladies' reception committee has been formed to assist in receiving the visiting ladies.

Tuesday, May 1 at 11 a.m. automobiles will be provided to take the ladies for a drive through the east side park system to the Wade Park Manor, where they will be tendered a luncheon by the Cleveland organization. This will be followed by other entertainment.

Tuesday night will be devoted to a theater party, the entire Keith Palace Theater having been chartered for the occasion.

A second automobile trip over the city is planned for Wednesday, the western part of the city and Lakewood being included in the route suggested. A card party and tea will be held at one of the beautiful clubs along the shores of the lake.

Wednesday night, May 2, is set aside for the annual subscription banquet of the American Foundrymen's Association. This will be followed by a reception and dance, offered by the local foundrymen and manufacturers.

Transportation Problems To Be Studied

That the study of transportation and the national transportation system will be continued by the Federated American Engineering Societies through the committee on transportation recently created has been announced by Dean Mortimer E. Cooley, president of the F.A.E.S., Dean Cooley in a statement said:

"The Committee on Procedure of the American Engineering Council some weeks ago authorized the appointment of a Committee on Transportation for the specific purpose of investigating and reporting to the Executive Board of the American Engineering Council of the Federated American Engineering Societies as to what, if anything, the societies could do with propriety and effectiveness in relation to the transportation problem of the American people.

"The committee was instructed to give consideration to all forms of transportation, that is, by railways, by motor trucks, and by water. Max Toltz of St. Paul, chairman of the committee, has made a progress report to the Executive Board of the American Engineering Council. In making his report Mr. Toltz pointed out many of the important phases of the very complex problem. He stated that the task was so large and ramifying that the committee would require more time in which to advise the Executive Board what, if anything, it should do. He further indicated that probably the best service the Federated American Engineering Societies could render would be to co-operate with a number of national organizations which had been working in this field for years.

"The general consensus of opinion of the Executive Board is that this is a matter of very grave import."

Buffalo Factories Report Capacity Business

Steel and iron companies in the Buffalo district are experiencing an unusually prosperous period. Most of the pig iron furnaces in the district are in blast and the selling has been very heavy for the first three months of the year.

The Lackawanna plant of the Bethlehem Steet Co. announces that it now has 8,400 men at work and the mills are being operated about 85 per cent of normal. Seven blast furnaces are being operated. Two new batteries of coke ovens are to be built.

The Wickwire-Spencer Steel Corp. is very busy, especially in its wire lines, automobile springs and electrically welded steel fabric for the building of concrete roads.

The Donner Steel Co. is more active than it has been in some time and its production is running heavy in the steel bar line.

The Seneca Iron & Steel Co. has its 13 sheet mills in full operation.

Canadian Railways Will Order Many Cars

The Canadian National Railways will soon allot contracts for the construction of many thousands of steel freight and passenger cars, the work to be started during the spring. The railway shops at different points on the different systems—Old Intercolonial, Grand Trunk, Transcontinental and Canadian Northern, will receive the major portion of the contracts according to present indications.

The Canada Car and Foundry Co. of Amherst, Nova Scotia, will receive a substantial contract from the Canadian National Railways for the construction of steel freight and passenger cars. This industry is the biggest in Amherst and one of the biggest in the maritime provinces.

With the prospect of car orders, the machine shops of eastern Canada will probably have the busiest spring and summer in many years. Since the close of the war, business at the machine shops has been stagnant.

Annual Report of United Alloy Steel Corp.

The United Alloy Steel Corp. in its annual report states that during the year 1922 the profits from operations amounted to $5,035,799 as compared with a loss of $67,523 during 1921. After the usual charges have been paid, each shareholder of common stock will receive a dividend of $3.46 per share and a surplus has been created that amounts to $1,570,607. In 1921 there was a deficit of $2,972,829 reported.

Skilled Labor Shortage in Milwaukee

General activity in the metal trades continues to expand steadily, with manufacturers of automobile units, and parts experiencing perhaps the heaviest call for their products and customers more insistent upon deliveries than in any other line. This industry is about the only one which has to report a scarcity of skilled labor, although the shortage arises largely out of the highly-skilled character of operations in which there is normally no surplus. Foundries and machine shops at present are able to obtain practically all of the common labor needed, but are apprehensive over the possibilities of a serious shortage when outdoor work is resumed on a seasonal scale. It is believed certain that contractors on public and private work will bid sharply against industries for unskilled workers, for the extent of these operations probably will be the heaviest in Milwaukee this year that has yet been recorded.

Manufacturers of construction equipment and machinery, principally concrete mixers, paving outfits, power hoists, etc., and of highway construction and maintenance equipment, are keeping maximum capacity employed and do not expect a let down as early as customary in the summer because a considerable part of orders was placed later than usual and deliveries necessarily will have to be carried through the greater part of the construction season.

While the bulk of orders for equipment already has been placed, a moderate amount of business remains to be entered by public and private electric light and waterworks plants, and by the paper and pulp industry in Wisconsin.

Local shops are interested in the requirement of the Metropolitan Water Supply and Sewerage Board of Brisbane, Australia, which is advertising in the Milwaukee newspapers that sealed tenders will be received until June 26 for additional machinery for the Mt. Crosby pumping station. J. P. Clark, acting secretary, is receiving bids.

In addition to extensive purchases of power plant and miscellaneous machinery purchased during the past year, the city and county sewerage commission of Milwaukee will be in the market from time to time for equipment for the Jones Island sewage disposal system, the principal unit of a new sewerage plant which will cost about $18,000,000 when completed.

Detroit Reports Indicate Good Conditions

The annual report of the General Motors Corp. for 1922, shows current and working assets of $180,239,160, consisting of cash, sight drafts, notes, and accounts receivable.

The amount earned on the common stock was $45,066,907.69. In 1921 the corresponding figure was $13,246,523.30, as against a deficit of $44,990,779.64 in 1921. This is equal to $2.19 a share on common stock. The surplus at the end of 1922 amounted to $89,936,863.08, compared with $55,814,160.46 the year before.

Frank H. Alfred, general manager of the Pere Marquette Railroad, appearing before the legislature at Lansing, Mich., announced that his company would expend $11,000,000 during the year for improvement and new equipment. Mr. Alfred spoke before the legislature denouncing the full crew train bill. He stated that if the bill was passed it would cost the railroads of the State of Michigan $1,500,000.

Henry Scherer, general manager of the Michigan Central Railroad, also spoke against the passage of the bill.

Persistent rumors about the Detroit Stock Exchange which predicted the refinancing of the Timken Detroit Axle Co. were denied by officials of the firm at a meeting at the Detroit Board of Commerce, recently. A report read at the meeting stated that "No intention of refinancing, or of any bond issue on its property will be put out at the present time."

Officials connected with the Calumet and Hecla Mining Co. admit that the deal to purchase the Detroit Copper and Brass Rolling Mills, a firm capitalized at $6,000,000, has progressed beyond the conversational stage. Belief that the sale may be consummated presently is strengthened by reports from the East that negotiations are in progress for the recapitalization of the Calumet and Hecla Co.

Metal Prices Will Cause Rise In Machine Tools

The increasing demand for high grade metal working machinery will cause a shortage in machinery of this type in the opinion of officials of the Indianapolis Tool & Manufacturing Co., Indianapolis. Because of the rapid recovery of the iron and metal markets, increases of from fifteen to twenty per cent are expected in prices of machine tools, electrical and power equipment, and many lines of machinery. It is pointed out that orders for metals are being accepted now in many quarters on a sixty to ninety day basis, which is indicative of the condition of the metal market.

At the Ross Power and Equipment Co., one of the large Indianapolis dealers in both new and second hand machinery, Mr. Ross states there is a considerable demand for both new and used machinery. The used machinery market seems very active, especially where the machinery offered is in good condition. At the present time a considerable demand is coming from the automotive industry here. These plants, according to him, have spent but little during the past three years for new equipment and replacements are becoming imperative. Manufacturers here of automobile accessories and tools are beginning to notice the improvement in the field and some expansions are contemplated which will entail much more new equipment.

Martin Parry Corporation Reports Big Gains

The Martin Parry Corp., Indianapolis, Ind., reports a net income of $402,248 for the year 1922, which, after the usual charges have been paid, amounts to $4.02 a share. In 1921 the corporation paid to each shareholder eight cents per share. Net sales during the year were $4,327,685 which was nearly double that of any previous year in the company's history.

Pittsburgh Machine Tool Trade Improves

Business conditions in this immediate district are in better shape now than at any time since the armistice. Many of the industrial plants are operating at higher rates than at any time in their history.

Reports from the machine tool men are that the industrial plants are buying heavily. The Westinghouse affiliated companies are heavy buyers for the transformer and motor departments.

The railroads have been disappointing buyers of machine tools, although it is known that they are badly in need of tools for repair work. Several of the local manufacturers bid on a great deal of work for the Conway yards in the Pennsylvania system last year, but so far no contracts have been made. Business is particularly heavy in radial drills, punchers, shears.

The steel mills buying machine tools are operating at about 90 per cent of capacity, but with the approach of the open season fear is expressed that labor will become scarce. To obviate this it is rumored that the Steel Corporation may announce a wage advance effective April 1, putting the common labor rate from 36 cents to 40 cents an hour, or 11 per cent, and other rates except sliding rates about 10 per cent. This may not be the end of the wage advance, either, for it is rumored that July 1 will see another. If the industrial plants keep up their present operating rates all year, the machine tool makers are apt to remain in their present optimistic mood.

Arbitration Successful on Pennsylvania R.R.

That many of the labor disputes that arise between employees and employers may be settled in an amicable manner, has been illustrated by the recent report of the industrial plan committee of the Pennsylvania Railroad. The plan has been in effect during 1922 and consists of monthly conferences between local representatives of employees and supervisory officers.

"A course of appeal," says the report, "is provided from decisions of the local officers, the superintendents, general superintendents and general managers to joint reviewing committees, equally representative of management and employees, but the number of cases received by the reviewing committees last week was less than 5 per cent of the total number of cases taken up with the local officers. As against 4,532 such matters taken up last year with officers below the grade of division superintendent, however, it was found necessary to take up only 297 cases with the general managers.

"Since the reviewing committees were established it has been found necessary in only one case to refer the matter to any other agency. In that instance, the joint reviewing committee of the engine and train service employees decided to refer a disputed question to a board of three arbitrators, one appointed by the conductors, one by the management and one by the two so appointed."

The report further cites cases where troubles have been successfully settled and both sides benefited.

Business Paper Editors Hold Spring Meeting in Middletown, Ohio

Attracted by the remarkable community spirit of Middletown, Ohio, as expressed by Bennett Chapple of the American Rolling Mill Co. at its annual meeting, the National Conference of Business Paper Editors met in that city on March 26 and 27 at the Hotel Manchester.

Monday morning and part of Monday afternoon were spent listening to and discussing papers presented by the officials of the American Rolling Mill Co. Unusual interest centered in the talk of Charles R. Hook, vice-president and general manager, on explaining the balance sheet to employees.

Visits to the plants of the Middletown paper companies and the rolling mills occupied the rest of Monday and all of Tuesday afternoon. An editorial round table discussion took place on Tuesday morning. It was followed by three papers on the manufacture and marketing of paper and one on research by the Armco research director.

A large banquet was tendered to the editors by the Middletown Chamber of Commerce on Monday evening. One of the features of the meeting was the extensive exhibit of Middletown products staged in the hotel basement. It ranged from samples of handiwork of boy and girl scouts to complete bicycles made by the Miami Cycle Co. The Shartle Bros. Machine Co. showed paper making machinery and the American Rolling Mill Co., the paper companies and the tobacco manufacturers were all represented.

Executive Board Meeting of the F.A.E.S.

The executive board of the Federated American Engineering Societies held a two day session in the Ohio Mechanics Institute, Cincinnati, Ohio, March 23-24.

The session opened with the president of the board, Dean Mortimer E. Cooley, of the University of Michigan, presiding. L. W. Wallace, secretary, and Harrison E. Howe, treasurer, as well as a number of other well known engineers, were present.

Among the important subjects discussed was an appeal for engineering aid in solving the coal problem from John Hays Hammond, Chairman of the Coal Commission; the situation in the building industry; transportation; engineering education; industrial waste; a campaign for the conservation of eyesight; the use of machinery to relieve the labor shortage. This last subject was submitted by W. S. Moody, and was referred to the committee from the American Society of Mechanical Engineers. Through the chairman of this committee the board was informed that the A.S.M.E. was willing to investigate the possibilities of the problem. For the information of our readers, we refer them to an article by K. H. Condit, editor of the *American Machinist*, on page 393, under the title of "Immigration—Or Machinery?"

A resolution was adopted favoring participation in a World Power industrial conference, to be held in London in 1924. The question as to whether the board should act as a clearing house in developing suggestions for the elimination of waste in industry was referred to the Society of Industrial Engineers, which meets in Cincinnati in May. The result of its action will determine the course of the board in this case. A resolution was also adopted thanking the newspapers of Cincinnati for their cordial support and thanking John T. Faig, president of the Ohio Mechanics Institute, for arranging entertainment for the visiting engineers. The next meeting will be held in St. Paul, Minn., June 8 and 9.

Philadelphia Machine Tool Plants Busy

All of the machine tool and heavy machinery plants in and around Philadelphia are extremely busy, according to reports which have been made in that city. Much of this prosperity is due to the demand from the railroad shops and the plants that are turning out engines, freight cars and other rolling stock for the railroads that are located in or near Philadelphia. The good fortune of these big plants is reflected in every machine tool shop in the city.

Another factor that is helping the machinery trade is the excellent condition in which the cotton industry finds itself at this season of the year. Cotton fabricators are good buyers of machinery just now and it is expected that this demand will continue for some time.

While prices are inclined upward in many instances, it is due solely to the main causes—metal prices and labor advances. But despite any changes that have been noted in the lists, not only new business is being booked but there has been a wealth of renewals from old customers who cancelled the same orders during the past two years.

Capacity output is reported from such plants as the I. P. Morris department of the William Cramp & Sons Ship and Engine Building Co., and the Southwark Foundry and Machinery Co. Other companies that report exceptional business are: Niles-Bement-Pond Co., Moore & White, Chamber Brothers, Proctor & Schwartz Co., and Thomas P. Mills & Brother.

Metal Trades Hold Meeting at Springfield, Mass.

At the annual meeting of the Western Massachusetts branch of the National Metal Trades Association, held in Springfield, Henry D. Sharpe, treasurer of Brown & Sharpe Co., Providence, spoke on industrial problems of New England, John C. Spence of the Norton Co., Worcester, spoke on industrial education, and Homer D. Sayre, Chicago, told of the activities of the National Metal Trades Association. The report read by A. R. Tulloch, local secretary, told of a large increase of membership and activity. Officers elected included: president, George H. Empsall, Duckworth Chain Co.; vice-president, Harry C. Beaver, Rolls-Royce of America, Inc.; treasurer, A. D. Scott, Hampden Brass Co.

The meeting was well attended and interesting discussions were enjoyed.

Gen. Ruggles Now Ordnance Assistant Chief

Col. Colden L. H. Ruggles has been appointed assistant to the Chief of Ordnance with the grade of Brigadier General. Gen. Ruggles succeeds Gen. George W. Burr who recently died.

Gen. Ruggles is well known to men of the machine tool industry. During the War he was a prominent figure in the Ordnance department having been for a time chief of the Inspection Division and also serving overseas. Besides having acted as professor of Ordnance and the science of gunnery at the U. S. Military Academy, he has been in charge of many proving grounds and arsenals in various parts of the United States and its Possessions.

General Electric Profits Prove Record

Despite the fact that the net sales of the General Electric Sales Co. were smaller during 1922 than during the previous year, the net profits reported were larger than any preceding year in the history of the company, according to the annual report recently filed. After all expenses, taxes, and depreciation were allowed each share of common stock earned $14.86. In 1921 the dividend was only $12.57 for each share.

The net sales, according to the report, were $200,194,294 in 1922 and $221,007,992 in 1921. The net profits were $26,231,019.

Personals

C. R. LEWIS, general manager of the Standard Forgings Co., Chicago, has been elected vice-president.

JOHN C. COTTER, formerly general sales manager of the J. H. Williams & Co., Brooklyn, joined the organization of the Western Drop Forge Co., Marion, Ind., April 1.

WILLIAM A. DURGIN of the U. S. Department of Commerce was the principal speaker at the spring meeting of the National Association of Brass Manufacturers which convened in Chicago March 23rd. He spoke on "Simplification Practice and Standardization Work."

PETER J. F. BATENBURG, noted Swiss-Franco engineering authority, since 1909 engaged in activities in the United States, has resigned as chief engineer and designer of the Mitchell Motors Co., Racine, Wis.

CALVIN W. RICE, secretary of the American Society of Mechanical Engineers, addressed a meeting of the Engineers Society of Milwaukee, held March 28 under the sponsorship of the Milwaukee Section of the A. S. M. E., on his recent trip to South America.

C. H. GUMBERT, for 15 years with the Clarke Motor Products Co., Jackson, Mich., and more recently engaged in automobile service work at Sioux City, Ia., has formed a partnership with T. B. NULL of Waupun, Wis., as Null & Gumbert, and opened a general machinery manufacturing and repair shop in Waupun.

JOHN C. BENNETT will be the manager of the New England office of the Marf Machine & Die Casting Co., Brooklyn. The New England offices will be located at 51 Harrison Ave., Springfield, Mass.

B. MOAS, JR., and J. M. ZAYAS have charge of the new Santiago, Cuba, office of the Westinghouse Electric International Co. The building is located at Jose A. Saco, baja, 11.

A. C. GOODALE has been appointed branch manager of the Cutler-Hammer Manufacturing Co., with headquarters at Detroit, Mich.

CHARLES HENRY TUIERM, formerly plant engineer of the Dominion Bridge Co., Lachine, Quebec, and also connected with the Dominion Engineering Works, Ltd., has resigned to accept the position of chief engineer and sales manager of the Northern Foundry & Machine Co., Ltd., with headquarters at Sault Ste. Marie, Ont.

JOHN T. FARMER of Montreal, has been appointed chief engineer and Montreal manager of the Combustion Engineering Corp., Ltd., of Toronto.

WILLIAM T. J. PURNELL, president of the Palmyra National Bank, and JACOB M. NOLL, formerly general manager of the Nelson Valve Co., have taken over the Camden Manufacturing Co., Camden, N. J., and in the future the company will be known as the Camden Die Manufacturing Co.

FRANK A. FRAY, assistant works manager, Geuder-Paeschke & Frey Co., Milwaukee, Wis., has been appointed chairman of the industrial section of the Public Safety Division of the Milwaukee Association of Commerce, which is reorganizing its former safety and sanitation activities. EMANUEL L. PHILIPP, president, Union Refrigerator Transit Co., and former Governor of Wisconsin, was elected president of the Association on March 1 and is engaged in revising the organization's program in many respects.

ARTHUR E. CLEGG, formerly of Antigo, Wis., has been appointed engineer on railway control in the control engineering department of the Westinghouse Electric & Mfg. Co., Pittsburgh.

J. A. CAMPBELL, engineer of the gas plants for the Union Oil Co., San Diego, Calif. has resigned to accept the position of engineer and manager of the plant of the Lomita Gasoline Co., Los Angeles, Calif.

REGINALD W. MILLARD, former president of the Foster, Merriam & Co., castings, Meriden, Conn., has resigned and will accept a position as Canadian manager for the W. B. Richards Co., industrial engineering experts, with headquarters at Toronto.

PROF. LESTER B. BRECKENRIDGE, chairman of the department of mechanical engineering, Yale University, has announced his intention of retiring from active teaching in June.

RICHARD A. KEMPIN, engineer of the Starrfräsmaschinen A.-G. Henri Levy, Rorschach, Switzerland, has sailed for Europe after several months spent in the United States demonstrating the "Rigid" milling machine that is made by his company. He also completed plans for the manufacture of the machine in this country.

R. B. TRIPP has been appointed sales manager of the Ohio Forge Co., Cleveland, being promoted from the position of purchasing agent, which he has held for the past six years.

H. A. BERG, assistant general superintendent of the Cambria Steel Co., has resigned that position to become general manager of the Marting Iron and Steel Co., Ironton, Ohio. Prior to November, 1920, Mr. Berg was general blast furnace superintendent of the Midvale Steel and Ordnance Co.

E. C. RANNEY and O. L. WEAVER have organized the Ranney-Weaver Co., Cleveland, for the purpose of operating Cleveland sales offices for the Erie Malleable Iron Co., Erie, Pa., Fedders Manufacturing Co., Buffalo, and the Weldless Tube Co., Wooster, Ohio.

Obituary

THOMAS S. CHALMERS, president Chalmers & Williams Co., manufacturer of mining machinery, died in Chicago recently of anaemia.

Mr. Chalmers was a major of artillery and served in France during the war. Because of his knowledge of metals, he was assigned to Washington as an expert in metals. He was later assigned to the French army and saw action.

AUGUST MATHIS, senior member of the firm of A. Mathis & Son and a resident of Chicago for 40 years, died suddenly in Chicago from a cerebral hemorrhage. Mr. Mathis was a pioneer in ventilating engineering projects.

F. W. FERNHOLTZ, vice-president of the Fernholtz Machinery Co., Los Angeles, Calif., died recently at his home in that city, aged 40 years.

Business Items

The Bridgeport Machine Co. has removed its plant from Augusta, Kan., to Wichita, Kan.

The Production Engineering Corp., Canastota, N. Y., has been incorporated to take over the business of the Marvin & Casler Co., Canastota. This corporation will continue to manufacture and sell the Casler tools for machine shops.

The Harvey Metal Corp., 105 West Monroe St., Chicago, has incorporated for $100,000 and 2,500 shares no par value. They will do forging casting, hot pressing, machining and finishing of metals, metalware, etc. Incorporators: Wm. C. Mason, Harold Harvey, H. C. Mullins.

Wage increases affecting several thousand men have been announced in some of the Titusville, Pa., plants including the Titusville Forge Co. and the Titusville Iron Works.

Directors of the Chicago Pneumatic Tool Co. at the annual meeting held recently increased the annual dividend from $4 to $5 and declared a quarterly dividend of $1.25 a share payable April 25 on stock of record April 14.

The Electro-Metals Radiator Corp., recently organized in Buffalo, is looking for a suitable plant in western New York.

The International Sanitary Manufacturing Co. has filed articles of incorporation at Oakland, Calif. with a capitalization of a million dollars. The company will make pipe castings, valves and sanitary appliances. The incorporators are, W. H. Miller, J. S. Bobba, A. H. Marchant, P. K. Bradley, F. W. Zuver and X. K. Weimer.

The name of the Associated Motor Industries has been changed to National Motors Corp. The company was primarily organized to take over the manufacturing plants of the following companies: The National Motor Car & Vehicle Corp. of Indianapolis; the Traffic Motor Truck Corp. of St. Louis; the Covert Gear Co., Inc., of Lockport; the Recording & Computing Machines Co. of Dayton; The Kentucky Wagon Manufacturing Co. of Louisville; The Jackson Motors Corp. of Jackson; the Saginaw Sheet Metal Works of Saginaw, Mich.; the Murray & Tregurtha Corp. of Quincy, Mass.

The Rome Brass & Copper Co. purchased the one story warehouse at the northeast corner of 37th and Racine, Chicago, from the Fitzsimmons Steel & Iron Co. for $85,000, according to the county records.

The Chicago Metal Manufacturing Co., 5724 S. Rockwell Street, was incorporated with a capital of $200,000. Harry F. Bennett, Geo. F. Hauf and Frank R. Atwood are the incorporators. The company will manufacture and deal in metals, metal products and by-products.

L. E. Block, chairman of the board of directors of the Inland Steel Co. has stated that when the Chicago district supplies a surplus of steel, the price of steel in Chicago and surrounding country will be no longer an amount equal to the price in Pittsburgh plus cost of transportation from Pittsburgh.

The Hayes Wheel Co., Chicago, plants are reported as operating 100 per cent capacity.

The Motor Products Corp., Chicago, plans to spend a million dollars for additional buildings, construction and equipment of the Detroit plant, according to D. B. Lee, president.

The Pullman Co., Chicago, has received an order from the Southern Pacific for 60 interurban passenger cars, costing approximately $900,000. Also an order from the same company for 10 diners, valued at about $400,000. The American Car & Foundry Co. will build for this carrier rolling stock to cost about $935,000. Forty combination baggage and postal cars, at an estimated cost of $800,000, will be constructed by the Standard Steel Car Co.

It is expected that this year's orders of locomotives will exceed the best previous record, established in 1905. It is now estimated that approximately 6,000 locomotives will be contracted for, compared with 2,668 last year.

The Western Chain Co., Chicago, has increased its stock $50,000 to $200,000.

Economy Clamp & Machine Co., Chicago, has increased its stock $25,000 to $100,000.

The Gibb Instrument Co., Bay City, Mich., manufacturer of electric welding equipment, has opened a sales office in Cleveland, Ohio, at 2104 East Superior Street, in charge of W. O. Little.

The Lima Foundries Co. of Lima, Ohio, has purchased the building it occupies at 228 E. McKibbin St. and will arrange at once to remodel its plant at a cost of about $10,000. J. B. Roundtree, president of the company, states that machinery valued at $45,000 will be installed to double the present capacity. Part of the new machinery has been purchased. When the plant is renovated, it will have an output of $200,000 a year and will be capable of producing any form of brass, bronze aluminum or gray iron casting from one pound to fifteen tons.

The construction of the new building of the Fisher Auto Top Co. at Pine and West Main St., Zanesville, Ohio, has been commenced. It will be equipped with the latest and best machinery used in the manufacture of auto tops and bodies. O. W. Fisher is the owner.

The Witherow Steel Co. of Pittsburgh, has plans in progress for extensions and improvements at its plant at Neville Island, to double, approximately, the present capacity. The company has recently formed a merger with the River Front Land Co. in this section, and has advanced its capital to $2,800,000 for general expansion. W. P. Witherow is president and Joseph Dilworth secretary of the company.

The Blackwood Electric Steel Corp., at Parkersburg, W. Va., recently organized, has commenced the erection of its proposed new local plant, to consist of a number of one-story buildings, with a main structure 140x230 ft. The initial plant with machinery is estimated to cost $100,000.

The Lorain Steel Co. at Johnstown, Pa., has construction in progress on a new building at its plant, to be used for general operations. Considerable additional equipment will be installed.

The Pittsburgh Construction Co. Pittsburgh has received a contract from the Baltimore and Ohio railroad covering the erection of three deck plate girder spans at Proctor, W. Va. The new spans vary in length from 40 to 103 feet, and the total weight of the steel involved is about 160 tons.

Robert Thompson, of Pittsburgh, one of the receivers of the Sharon Pressed Steel Co., announces that prospects for the sale of the property are very bright. Liquidation is about completed, and the Federal court at Pittsburgh will be asked to pass on the sale.

The Standard Tank Car Co. at Sharon, Pa., has been awarded the construction of 500 tank cars representing a value of $1,250,000, making not less than 1,000 tank cars contracted for in the last two weeks. Orders just placed were those of the Texas Co., New York, 50 cars; Roxana Petroleum Co., St. Louis, 350 cars, and the Phillips Petroleum Co., Bartlesville, Okla., 100 cars.

The mechanical laboratory of the Sibley College of Engineering, Cornell University, was recently damaged to the extent of $10,000 by fire.

The executive offices of the C. G. Spring Co. have been moved from Kalamazoo, Mich., to Detroit, Mich.

The Milwaukee Electric Railway & Light Co. is completing purchases of equipment for Unit No. 3 of the Lakeside steam generating plant. The initial unit, of 40,000 kw. capacity, was completed in 1921. Unit No. 2, of 30,000 kw. capacity, was completed in October, 1922, and contracts for erection of Unit No. 3, also of 30,000 kw. capacity, have recently been placed. This plant is already the largest yet constructed for the use of pulverized fuel exculsively.

The plant of the Northern Foundry Co. at Marinette, Wis., which has been largely inactive for the past year, has been taken over by a new corporation, the Republic Match Co., organized in Wisconsin with $100,000 capital stock, to manufacture safety matches. The plant will be entirely retooled, although much of the initial equipment will be derived from a match factory operated in leased quarters at Chicago by the principals in the new Wisconsin corporation, who are represented by Joseph M. Fitzpatrick, A. J. DeLeers and John O. Miller.

The Rex Typewriter Corp., Fond du Lac, Wis., has changed its name to The Demountable Typewriter Co. to better distinguish its product. The company during the past year developed a new design of writing machine of standard dimensions, embodying general demountable features in respect to all principal parts, and this design recently was placed in production exclusively.

Emil B. Gennrich, 717 Forty-sixth Street, Milwaukee, who has been secretary-treasurer of the Hercules Steel Casting Co., Milwaukee, for six years, has obtained an option on the Milwaukee steel foundry of the J. I. Case Threshing Machine Co. in West Allis. A new corporation is in process of organization to take over and operate the plant. Definite information is withheld for the present, but it is understood to be the intention of the principals to install electric furnace equipment and melt steel by both the electric and the converter processes.

New members accepted by the Engineers Society of Milwaukee at the March meeting of the executive council are: Lucien I. Yeomans, chief engineer, A. O. Smith Corp.; G. W. Smith, chief engineer, Nash Motors Co., Milwaukee works; Carl Mitchell, chief engineer, Illinois Steel Co., Bay View works, Milwaukee; William M. Bager, chief engineer, Bucyrus Co., South Milwaukee; Oscar Frohman, chief engineer, and Emil Tranaas, engineer, Koehring Corp.; Harold A. Mantz, engineer, Briggs & Stratton Co.; Herbert L. Voigt, assistant superintendent, Geuder-Paeschke & Frey Co.

The following officers were elected for the ensuing year at the annual meeting of the Precision & Thread Grinder Manufacturing Co., Philadelphia recently held; A. T. Doud, president and general manager, W. H. Frick, vice-president and chief engineer, F. V. Doud, treasurer and W. C. Greger, secretary.

The central sales office of the Naval Department, United States Government, will have a sale of surplus valves. Sealed bids will be opened at the Navy Yard, Washington, D. C. at 11 a.m. April 11.

The Rhinelander Electric Light & Power Co., Rhinelander, Wis., will enlarge its hydro-electric and auxiliary steam generating plant at a cost of about $75,000 this year. Mead & Seastone, consulting engineers, Madison, Wis., have been commissioned to prepare plans. These will be completed about April 15.

The Wausau Paper Mills Co., Wausau, Wis., will replace its timber dam at Brokaw, Wis., with a reinforced concrete structure, and enlarge its hydro-electric powerhouse and general mill building group. The power dam project alone represents an investment of $300,000. The coffer-dams will require 800 tons of Lackawanna sheet piling. W. L. Edmonds is general manager.

The Sanitary Dishwashing Machine Co., 382 Tenth Street, Milwaukee, Wis., has accepted the proposition of the Commercial Club of Burlington, Wis., to relocate its headquarters and offices on condition that a suitable building be provided.

The Milwaukee Sewerage Commission, 578 Market Street, Milwaukee, Wis., is asking bids until April 13, at 1:30 p.m., for designing, manufacturing and erecting two 20-ton, three-motor electric traveling cranes and three 10-ton hand-operated traveling cranes or three 10-ton traveling cranes with motor hoisting apparatus and with bridge, and hand-operated. The equipment is required for the sewage disposal plant being constructed and equipped on Jones Island as the principal part of a $20,000,000 municipal sewerage system. T. Chalkley Hatton is chief engineer of the commission; John H. Fowles is secretary.

The Capital City Culvert Co., Madison, Wis., has amended its corporate articles to increase the capitalization from $50,000 to $100,000. It is enlarging its business to conform with the greatly increased state highway construction program. Charles M. Easterly, district manager, Inland Steel Co., 221 Grand Avenue, Milwaukee, is president, and Gustave N. Schneider, Madison, is treasurer and general manager.

The Southern Metal Trades Association of Atlanta, Ga., has announced that there are now twenty-seven furnaces in Alabama in active operation producing pig iron and production in this line has reached its highest point in years. March production is estimated to be the largest since May, 1917.

The Am-Plus Storage Battery Co., Chicago, is now located in its new building, 429-433 W. Superior St. The old plant was destroyed by fire on Jan. 24 and the new plant, which has been built in the meantime, has double the floor space that the old one contained.

D. C. Morrow, vice president of the United Iron Works, Inc., Chicago says the amount of orders for February this year shows an increase of 120 per cent over February, 1922. The company's business on refrigerating and ice making machinery is excellent, and its business in rig irons used in the drilling of oil wells is better than it has been for several months.

News of Washington Activities

By PAUL WOOTON

Events in Europe have widened the opportunity for export of American machinery, according to reports of the Department of Commerce, increasing the optimistic outlook for 1923 business in this line which was suggested in January by a special report by the Machinery Division of the Bureau of Foreign and Domestic Commerce.

Several specific instances have come to the attention of the Department recently where orders previously placed with German manufacturers for industrial machinery have been cancelled and placed with American firms. This dates not only from the time the French and Belgians occupied the Ruhr, but previously, when it became apparent the deliveries could not be guaranteed by many German firms because of economic conditions in that country.

American manufacturers who are keenly after export trade which has been growing steadily in machinery for the last decade, appear to believe that some of the French and Belgian manufacturers will not be able to keep abreast with deliveries and orders because of the difficulties being experienced in the metallurgical industries because of shortage of fuel, although this is realized to be a temporary factor, of much less probable duration than the disturbed condition of the German manufacturers.

Statistics of the 1922 export trade in machinery have not been completed sufficiently to permit analysis, but probably will show a decline both in volume and value as compared with 1921 totals, it is said. It is pointed out at the Machinery Division, however, that apparently machinery exporters of the United States fully held their own in 1922 with competitors of other countries.

Internal combustion engines, while machines within the definition of the dictionary, are not so known commercially and therefore when imported should be dutiable under the clause of the metals schedule of the 1922 tariff at 40 per cent ad valorem instead of under the catch-all bracket of the machine paragraph at 30 per cent, according to a Treasury decision.

The decision, in the form of a letter addressed to the collector at New York and signed by Assistant Secretary McKenzie Moss, is:

"The Department is in receipt of your letter of March 6 in regard to articles which are properly dutiable under the provisions in Paragraph 372 of the Tariff Act for 'all other machines.'

"The Standard dictionary defines a machine as any combination of inanimate mechanism for utilizing or applying power, and the Century dictionary as any instrument for the conversion of power. Under these definitions, engines, whether the motive power is steam or otherwise, are in fact machines. However, as commercial designation ordinarily controls the classification of imported merchandise the Department is of the opinion that notwithstanding internal combustion engines, for instance, are machines within the dictionary meaning, they are not so known commercially and are accordingly dutiable under Paragraph 399 of the Tariff Act at the rate of 40 per cent ad valorem.

"You will be governed accordingly in the classification of the articles falling within the principle of this decision."

Ferrosilicon from Canada

Acting under the anti-dumping law of 1921, the Treasury Department has issued a dumping order affecting ferrosilicon from Canada. Under this order, collectors of customs are instructed to investigate each entry of ferrosilicon from the dominion and if it can be established that the price at which it was sold for delivery in the United States is less than the price of delivery to purchasers in Canada, a sum shall be added to the duty sufficient to equalize the two prices.

Under the 1922 tariff, the duty on ferrosilicon containing 8 per cent or more of silicon and less than 60 per cent is 2 cents per pound on the silicon content; containing 60 to 80 per cent silicon, 3 cents per pound; containing 80 to 90 per cent silicon, 4 cents per pound; containing 90 or more per cent silicon, 8 cents per pound on the silicon content.

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0322	$0.0312	$0.0229
Cold finished shafting	per lb.	0.0406	0.0402	0.0317
Brass rods	per lb.	0.1904	0.1804	0.15
Solder (½ and ½)	per lb.	0.314	0.2617	0.20
Cotton waste	per lb.	0.1231	0.1181	0.109
Washers, cast iron (½ in.)	per 100 lb.	4.50	4.33	3.83
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	2.96	2.96	3.11
Lard cutting oil	per gal.	0.575	0.5575	0.61
Machine oil	per gal.	0.349	0.349	0.40
Belting, leather, medium	off list	42%	49%	46¾%
Machine bolts up to 1 x 30 in.	off list	48½%	51½%	64½%

Two Plants of Standard Parts Co. Sold

Two of the eight plants of the Standard Parts Co., Cleveland, Ohio, and three of its service stations were recently sold by an order approved by Federal Judge Westenmeyer to a banking syndicate of Grand Rapids, Mich., headed by Howe, Snow and Bartles. The plants sold were the Pontiac Springs Co. at Pontiac, Mich., and the Perfection Springs Co., Cleveland. The service stations sold were located at New York, Boston and Cleveland. The other five plants and other service stations will be sold at a later date and by auction.

Higher Costs in Industry Pointed Out

In reporting upon costs in industry, the *Industrial News Survey*, published by the National Industrial Conference Board, New York City, says:—

"The trend toward higher costs in industry is gradually gaining momentum and should command public attention. Higher costs of labor and materials seem to be the rule. Demands by labor for higher wages have been made in a large number of industries. These demands in whole or in part have been granted in a large proportion of the cases. Even during the past week, notices of such increases—demanded or granted—have appeared: plumbers of Denver have received an increase of $1.00 a day; carpenters in Cleveland have signed an agreement calling for $1.25 an hour; copper miners of Michigan have received wage increases ranging from 15 to 20 per cent; Buffalo plasterers are demanding $12.00 per day; clothing workers in Boston, Chicago, Baltimore and Philadelphia are demanding or have already received increased wages amounting generally to 10 per cent; some silk employees are asking a 20 per cent increase; and now it is reported that wages for common labor in steel industry may be increased either this month or next from 36 to 40 cents per hour. The seriousness of these increasing demands and the temper of the workers is revealed in the large number of requests for increased wages which when they are not granted promptly, result in strikes. In some cases employers have anticipated these demands and have made increases in order either to avoid strikes or to hold their help.

"Upward price movements in many basic materials have begun to affect the general level of wholesale prices. Between October 1, 1922, and March 10, 1923, the price of copper increased from 13¾ to 17 cents per pound; cotton from 21¾ to 30¾ cents; lead from 6¾ to 8¾ cents; rubber from 20 to 34¾ cents; zinc from 6¾ to 8¼ cents; sugar from 5.53 to 7.28 cents; and petroleum from $3.00 to $4.00 per barrel. Wholesale prices have recently reflected this advance. Bradstreet's index during the same period has advanced from 135.8 to 151.2; Dun's index from 161.8 to 186.2; and the Federal Reserve Bank of New York's index of twenty basic commodities from 144 to 159.6."

Railways Place Big Orders For Equipment

During the month of February, there were ordered 102,912 railway cars and 1,945 locomotives, according to a recent statement of the American Railway Association. There is more equipment now on order than at any other time in the history of transportation and from all indications there will not be much of a let up during the entire year. Better equipment is being ordered than was formerly the case.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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AT THE COMMENCEMENT of last week, the speculative markets were quite weak, but when it became known that the Federal Reserve conference in Washington would adjourn without making any pronouncements or taking any action looking toward an advance in the rediscount rate, there was a hesitant recovery in the more mercurial stocks and commodities.

It is, however, plain that speculators have been cowed by the fear that the power of the Federal Reserve System would be used to curb their activities and, while there are some who resent such restraint, there is no denying the potency of its influence. We may, therefore, take it for granted that there will be no recurrence of what used to be called a "boom," in the immediate future.

Meantime it is to be observed that the chief effect of the advance in the money market, which followed the action of the bank in raising the rediscount rate from 4 to 4½ per cent, has been to reduce the value of farm products and Government bonds, without checking the upward tendency of wages or of the manufactured articles whose cost is increased by the higher wages paid.

Thus cotton, wheat, corn and Liberty Bonds are all substantially below the highest prices of the year, while iron, steel and copper are at the top and wages continue to advance.

Following the lead of the American Woolen Co. the Amoskeag Co. advanced operatives' wages 12½ per cent and, as these two companies are respectively the largest woolen and cotton manufacturers in the United States if not in the world, their action is practically a guarantee of higher wages throughout the textile trade.

Many other New England mills, including the Pacific, have followed suit and in the South a 10 per cent advance in wages has already been ordered at several points in North and South Carolina, including Wadesboro, N. C., and Gaffney and Spartanburg, S. C.

In the steel industry, a general advance in pay is expected when Judge Gary gets back from Europe, if not sooner, and in many other lines employers have been compelled to pay more or lose their help.

Alluding to these opposing price tendencies, Herbert Myrick, Editor of *Farm and Home*, has been moved to write to the Secretary of the Treasury as follows:

"Wages in many lines have been advanced. Prices have been jacked up of what farmers have to buy; there has been no corresponding advance in prices for what farmers have to sell. Capital and labor in other industries are shooting up, regardless of agriculture.

"If farmers are to pay for what they buy prices high enough to support existing values in other lines, it will be necessary for the farmer to receive an average net price at his farm of $2 a bushel for wheat, $1.50 for corn, $1 for potatoes, 75c. a pound for butter, 10c. a quart for milk and other produce in proportion; that is to say, the farmer must receive about twice current prices. Do not deflate the farmer while inflating the other fellow."

It is this disparity between the farmer's earnings and his cost of living that is leading many to doubt whether a prosperity that is so one-sided can be permanent.

> "Nearly all of the oracles of business are optimistic as to the future. Most of them are agreed that the impetus of our present activity will carry well into autumn and some insist that it will be two or three years before any serious reaction occurs. But the stock market does not reflect the confidence that the expert diagnosticians express. It has ceased to advance and activity is generally at the expense of values."

Fundamentally the economic disorganization of Europe is the cause of the low prices at which many of our agricultural products are selling and as there seems to be but little hope of an early improvement in conditions abroad it is futile to expect an increased demand from that quarter.

For this reason caution continues to be advisable, although nearly all the oracles of business are optimistic as to the future. Most of them are agreed that the impetus of our present activity will carry well into the autumn and some insist that it will be two or three years before any serious reaction occurs.

But the stock market does not reflect the confidence that the economic diagnosticians express. It has ceased to advance and activity is generally at the expense of values. Even the railroad stocks are dull despite the enormous traffic and increased earnings that are reported.

The market for both taxable and tax exempt bonds is also easier and while some attempt to explain the weakness upon the theory that a portion of the capital that was invested in bonds is now being released for commercial use it is evident that the investment demand is for some reason less eager than it was.

It is, however, to be admitted that as one gets away from the environs of Wall Street, business seems to be good. Traveling salesmen report an excellent demand, but for comparatively small lots of goods. Frequent reorders are a consequence, for no one seems disposed to stock heavily at present prices. This is a good feature for it indicates that there has been little or no speculation or anticipatory buying. The steel industry and the motor factories are both running up to capacity and the demand for automobiles is apparently insatiable. Building materials are slightly lower as Mr. Hoover's suggestion that the Government should postpone all unnecessary construction is apparently being heeded by many individuals who were planning to build on their own account.

New York is meantime importing bricks from Holland and while coal from England is being unloaded at Boston, American coal is being shipped from Newport News and Norfolk to Italy.

These anomalies of commerce indicate the economic maladjustment of the world which is a result of the war. Until it is corrected and the waste that it causes can be prevented business is likely to be "spotted"—good here and bad there. To Cuba, for instance, the much discussed advance in sugar has brought renewed prosperity and speculation is again so rife there that the long distance telephone wires between Havana and New York are severely overtaxed during the hours that the New York Coffee and Sugar Exchange is open.

From England a general strike of farm laborers is reported, which may perhaps account for the consideration accorded the socialistic measures recently introduced in Parliament.

In China political conditions seem to be growing worse rather than better and great demoralization is reported from some of the provinces. Things in Mexico are, however, on the mend and as the Obregon government becomes more stable it is becoming more constructive.

France is sending an additional 20,000 troops into the Ruhr and the resistance of Germany appears to be growing more stubborn and more sullen. If a way out of the resulting impasse could be found the effect upon the world's business would be electrical, but while two of the world's greatest nations are clinched as are France and Germany at present there cannot be much hope of an economic revival in Europe.

Car Shortage Decreases

During the week ending March 14, the shortage of freight cars decreased by 4,828 as compared with the number of March 7. On March 14 the shortage totaled 74,442. Reports from roads showed that there were available for immediate service 12,461 repaired cars which was a reduction of 768 as compared with the previous week.

British Business Slow in Improvement

Machine tool trade is better, but far from ideal—Next exhibition in 1924—Railroads prove poor buyers—Association makes annual report

BY OUR LONDON CORRESPONDENT

ANY CHANGE in the machine tool position here is probably for the better, but it is not pronounced, and the improvement in general engineering conditions, which was in some quarters thought to have started towards the end of last year, has not developed to any extent. Of course a number of orders have been received, but in other directions, as for example shipbuilding, expectations have not been realized. Several reasons might be mentioned for this, but it is perhaps sufficient to note the unsatisfactory position on the continent of Europe.

That no excessive hopes are animating the machine tool industry will be gathered from the statement that, while after postponement from year to year, it was definitely decided that the next exhibition to be organized in London by the Machine Tool Trades Association should be held in the autumn of 1924, yet it was agreed at the annual general meeting held on March 14 that the whole subject should be reviewed in the light of business prospects towards the end of the current year. The hall has been definitely engaged, but if there is a further postponement it can be sublet.

RAILROADS ARE CAUTIOUS BUYERS

As these columns have shown, for some time past the railway companies have been expected to provide opportunities for the machine tool industry to demonstrate on a large scale that better machining methods and processes are available than will commonly be found in at least some of the railway shops. The amalgamations of the lines having been effected, a few orders have followed. But they are a mere trickle compared with the flood which, it was felt, the railway engineers would be quite justified in letting loose. For the rest there has been a little more business with India, and Australia has again been a good friend for tools of ordinary type.

One view is held with increasing firmness, namely, that prices of tools are not likely to be further reduced to any marked extent, although there is no hope at present of following the example set by some American firms of advancing prices. The plain fact is that higher prices could not be obtained, and second-hand tools are readily available in good condition at but a fraction of the first cost. Still, although the current demand is low, the position has been improved when compared with say 12 months ago, for a number of firms have reduced their stock and the machine tools still for disposal in government hands are relatively few in number and are not of a quality likely to compete with present-day productions.

TOOL TRADE NEEDS IMPROVEMENT

What the machine tool trade needs is a definite improvement in the general engineering position. Then the improved means of production that can be provided will be appreciated, and the machine tool maker will meet his reward.

A number of time studies of machine tools engaged on miscellaneous work at the Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, provided the most valuable section of a paper read recently before the Manchester Association of Engineers by G. E. Bailey. In but few instances was repetition work involved, and the observations, detailed as to cutting time, job-, tool- and cut-setting, gaging, personal, miscellaneous, waiting and breakdown, were taken under ordinary working conditions for periods of time ranging from less than 4 hours up to 24 hours, or more. The machines were almost entirely either of English or American manufacture.

"One view is held with increasing firmness, namely, that the prices of tools in Britain are not likely to be further reduced to any marked extent, although there is no hope at present of following the example set by some Americans of advancing prices. The plain fact is that higher prices could not be obtained and second-hand tools are readily available in good condition at but a fraction of the first cost."

The importance of handling time is brought out in the first table, which relates to a series of 20 observations of radial and pillar drills, where the cutting times reached 50 per cent of the whole time in only three instances, and it is shown that, even if double cutting capacity were obtained and the other conditions remaining the same, the gain in average efficiency of the radial drills would be about 14 per cent and of the upright drills not 18 per cent. The average efficiencies, except in cases where multiple setting applied, is less than 28 and less than 36 per cent respectively. The job-setting time averages in the same circumstances about 22 per cent.

CENTRALIZED CONTROL

The advantage of centralized control for radial drill motions is shown by a table indicating a saving approaching 40 per cent in the time of cutting and handling, without reference to the setting of the job, and so on. For twenty-one milling machines the percentage cutting times were fairly high, though in one case it was only about 20; but job-setting formed a relatively large proportion.

As to 15 planers, the actual cutting time is in most cases low, amounting in only one instance to 41 per cent. Of course the total running time, which includes not only the actual cutting time but also the non-cutting portion of the stroke and the return, is considerably higher. In the 10 vertical boring mills the most remarkable point is the very different results that may possibly be obtained when duplex machines are employed, the cutting percentage on the one table being less than 10 and on the other table of the same machine approaching 64. The twelve horizontal boring machines have cutting percentages seldom below 30, and the general average for 13 ordinary center lathes is considerably higher, ranging in fact from 36 up to 76. As to grinding machines, for the 5 cylindrical grinders the cutting percentage ranged from say 42 to 68.

For the vertical boring mill of duplex form, the author advocates an additional (central) head for turning and facing, to operate on either of the two tables, and he shows the economy that may result from the employment of horizontal boring, facing, milling and drilling machines of the Pearn type. He also advocates to some extent the use of double-cutting planers, though his assertion that these are not offered by machine tool builders is not quite justified by the facts.

In proof it may be mentioned that J. Buckton & Co., Ltd., Leeds, recently shipped abroad a machine for planing up to 25 ft. long by 10 ft. by 10 ft., with electrical drive which permits cutting at 15 ft. to 45 ft. a min., and a quick return, when used, at 75 ft. a min.; or, as the four tool boxes, two on the cross slide and one on each upright, are double-cutting, the machine table can be run at the same speed in the two directions. It may be worth adding that, in common with the Loudon firm at Johnstone, the firm use a drive of Sellers type, that is, by spiral pinion and rack.

ANNUAL REPORT OF ASSOCIATION

The annual report of the Machine Tool Trades Association dealing with the year 1922 shows a net membership of 135 against 162 two years ago. Most of the matters dealt with are of domestic interest only, but in view of the fact that the late George Richards maintained his American nationality, though working in Great Britain for the greater part of his life, it is permissible to state that the Association made a contribution of £100 to the fund raised, and the council have made an appeal to members, definitely mentioning that "it is hoped that friends in America will also contribute."

Another attempt has been made to bring the industry under the protection of the Safeguarding of Industries Act. It will be remembered that some time ago information as to the prices of German-made machine tools, the number of hours worked in the British machine tool shops, etc., was communicated to the government officials concerned, with the result, however, that the Board of Trade decided against reference to a committee, mentioning nevertheless that the application might be renewed. Now towards the end of last year, in view of the pronounced depreciation of the mark, and, it is asserted, "considerable increases in the volume of machine tools imported from Germany," it was decided to make a further application. This, it seems, has also been turned down for the time being.

Book Reviews

Practical Factory Administration. By Matthew Porosky. 244 pages, 5¼x8 in. Illustrated by charts and line drawings. Published by McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York.

As the author points out in his preface there certainly have been many changes in the accepted practice of factory administration during the last years. His book is an attempt to bring our information down to date on this subject without putting too much emphasis on details.

A valuable feature of the work is that little time has been spent on the big plants about which so much has been written, the bulk of the space being devoted to the problems of the small and medium-sized plant. The book begins with the fundamentals of industrial organization and follows through equipment, material and personnel handling methods to the final chapter on synchronizing sales and production.

A list of questions at the end of each chapter makes the volume suitable for class and instruction work. Appended to each chapter is a list of reference books.

Machine Tools and Their Operation, Part II. By Fred H. Colvin and Frank A. Stanley. Cloth board covers, 404 pages, 6x9 in., profusely illustrated. Published by the McGraw-Hill Book Co., 370 Seventh Ave., New York, N. Y. Price $4.

This book is a continuation of the previous volume of the same title and is divided into seven sections, dealing respectively with planers, shapers, slotters, broaching, gear-cutting and grinding machines. The various standard machines of each class are shown in half-tone as well as by assembly drawings that give the shop names of the various parts.

Each subject is presented in a clear and comprehensive manner that will enable even the beginner to grasp the principles involved. Directions for setting up, caring for and operating the machine are given, together with examples of fixtures and devices for holding regular and special work, tools to be used upon different classes of work, and tables of feeds and speeds for the various operations and materials.

The section on gear cutting shows how individual spur, bevel and helical gears are made upon the tool room miller, as well as how gears are produced in quantities upon gear cutting machinery designed especially for the purpose. The subject of grinding is treated in a very thorough manner and includes specific instructions in preliminary details, such as preparing work for the grinder, selecting, mounting and care of wheels, grain and grade, wheel and work speeds, etc., as well as in handling many of the more complicated jobs that fall to the lot of the grinding machine operator.

It is a book that will be found invaluable by the beginner, the specialist in any of the lines treated, or the all round man who desires to gain a more thorough and comprehensive knowledge of his trade.

Year Book (1923) of American Engineering Standards Committee. Paper covers, 48 pages, 8x10½ in. Published by the Engineering Standards Committee, 29 West 39th St., New York, N. Y.

The book gives the outstanding developments in American Engineering Standards Committee work during 1922 and shows that great progress has been made during that year in standardizing projects affecting mechanical engineering and metal industries.

The report relates that at the end of the year, 121 industrial standardization projects were definitely under way or had been completed and the standards approved. Of the projects that have reached official status, twenty-three have to do with mechanical engineering; twenty-one with civil engineering and the building trades; fifteen with electrical engineering; three with automotive subjects; twelve with transport; one with ships and machinery; fifteen with ferrous metals; four with non-ferrous metals; twelve with chemical subjects; two with textiles; four with mining; and nine projects with topics of miscellaneous or general character.

The 275 national bodies, technical, industrial and governmental, that are named, are shown to be co-operating in the work of the A.E.S.C. through officially accredited representatives. The names of the 917 individuals who are serving on the sectional committee, that carries on the actual standardization work are also given.

One of the most important accomplishments as set forth in the year book was the development of a plan of co-operation between the Federal Specifications Board, the body which develops the specifications for all government purchases, and the A.E.S.C. The board now submits informally to the A.E.S.C. all its specifications before definite adoption. Through the plan the government receives the criticisms of industry through the organizations which speak for those branches of industry that are concerned with any particular standard. The specifications already submitted are those for hose for various industrial purposes, wood screws, sterilizing equipment, numbered cotton duck, phosphor tin, pig lead, silicon copper, asbestos millboard, creosote oil, and insulated safes and cabinets.

The yearly progress regarding co-operation with foreign standardizing bodies, publications and information service is also published. Some historical matter is given regarding the purpose and organization of the A.E.S.C. together with its method of working. The revised constitution and rules of procedure are set forth for the consideration of the readers.

A complete list of the projects that have come before the body since its organization, the standards approved in 1922 and the standards before the committee on Jan. 1, 1923, are given. Also, the names of the co-operative bodies; firms that have given financial support, member-bodies and representatives and members and their alternates are given in alphabetical order.

Trade Catalogs

Heavy Duty Lathes. The R. K. LeBlond Machine Tool Co., Cincinnati, Ohio. The LeBlond 13 and 15 in. heavy duty lathes are described in a new catalog issued by this company. The single pulley drive geared headstock and the double friction back gear cone type headstock are both explained and many illustrations of the parts and the lathes assembled are contained in the booklet.

Air Filters. Midwest Steel & Supply Co., 28 West 44th St., New York City. A folder describing the Midwest United Air Filter has recently been issued by this company. In the text it is proved that dust and dirt can be successfully removed without materially stopping the passage of the air.

Recording Gages. The Bristol Co., Waterbury, Conn. Catalog No. 1006 has recently been published and contains eighty-three pages with perforations on the left side for filing. Many different kinds of recording gages are described and illustrated in the catalog and the uses of each gage is shown.

Portable Woodworking Machinery. The Oliver Machinery Co., Grand Rapids, Mich. The parts of the machine and the accessories are listed, described and illustrated in a recent catalog issued by the concern. Band saws, saw benches, knives and cutter heads, hand planers and jointers, sanders, trimmers, and vises are included in the catalog.

Multi-Speed Motors. The Louis Allis Co., Milwaukee, Wis. The Watson Multi-Speed motors are shown in the recent catalog issued by this company. Excellent illustrations and art work bring out to the best advantage the many phases of this motor.

Production Tools. Scully Jones & Co., 2012 West 13th St., Chicago, Ill. Chucks, sockets, cutters, tap chuck holders, two-lipped end mills, reamer holders, and many other valuable tools are listed, illustrated and described in a recent catalog. Sizes, tables and dimensions are to be found in the booklet.

Scrap Metal Presses. Logemann Brothers Co., Milwaukee, Wis. A folder recently issued by the concern shows its products and describes their many advantages.

Westinghouse Air Brake Has Good Year

The Westinghouse Air Brake Co. in its annual report for 1922, shows a total profit of $7,924,915 as compared with $1,412,490 reported for the year 1921. After allowing for Federal taxes and other fixed charges, the earnings are equivelant to $11.94 a share on the $50 common stock shares. In 1921, only $1.21 was paid to the stockholders for each share.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Machinery and equipment for confectioners, butchers and bakers. Sweden. Purchase. Quotations, c.i.f. Swedish port. Terms, Cash against documents. Correspondence, Swedish. Reference No. 5755.

Machine for breaking the cohune (babasen) nut of Central America in commercial quantities. England. Catalogs and quotations desired. Reference No. 5757.

Machinery for manufacturing brooms and broom corn, handles, wire, etc. Mexico. Purchase. Prices and catalogs desired. Reference No. 5779.

Can-making and cannery machinery for small meat canning plant. Fiji Islands. Purchase. Quotations, f.o.b. American port. Reference No. 5833.

Flour-milling machinery and equipment. Poland. Purchase and agency. Quotations, c.i.f. Danzig. Terms, cash on receipt of goods. Correspondence, Polish, German or French. Reference No. 5834.

Machinery for knitting hosiery for men and women. Mexico. Purchase. Quotations, f.o.b. El Paso, Texas. Terms, cash. Correspondence, Spanish. Reference No. 5835.

Wire-tying machines used in strapping boxes and tying bales. Spain. Manufacturer's agency. Catalogs and price lists requested. Reference No. 5836.

General line of automotive equipment of the best quality. Canada. Purchase. Quotations, f.o.b. Canadian port. Reference No. 5840.

Printing machinery and type, bookbinding machinery and tools. Canada. Purchase. Quotations, f.o.b. place of manufacture. Reference No. 5846.

Forthcoming Meetings

National Metal Trades Association. Twenty-fifth annual convention to be held at Hotel Astor, New York City, April 18 and 19. L. W. Fischer, secretary.

Society of Industrial Engineers. Spring convention at Hotel Gibson, Cincinnati, Ohio, April 18 to 20. Secretary, George C. Dent, 327 South La Salle St., Chicago, Ill.

American Gear Manufacturers' Association. Seventh annual meeting April 19, 20 and 21, Hotel Cleveland, Cleveland, Ohio.

National Foreign Trade Council. Annual meeting at the Grunewald Hotel, New Orleans, La., May 2, 3 and 4, 1923. O. K. Davis, Secretary, 1 Hanover Square, New York City.

American Foundrymen's Association. Annual convention, and exhibition at Public Hall, Cleveland, Ohio, April 30 to May 3, 1923. C. E. Hoyt, 140 South Dearborn St., Chicago, is secretary.

American Electro Chemical Society. Semi-annual meeting, Hotel Commodore, New York City, May 3 to 5, 1923. Colin G. Fink, 327 South La Salle St., Chicago, Ill., is secretary.

National Supply and Machinery Dealers' Association; Southern Supply and Machinery Dealers' Association; and the American Supply and Machinery Manufacturers' Association, triple convention, in Cincinnati, Ohio, May 17, 18, 19, 1923. F. D. Mitchell, 1819 Broadway, New York City, is secretary.

American Society of Mechanical Engineers. Spring meeting at Montreal, Can., May 28 to 31. Calvin W. Rice, 29 W. 39th St., New York City.

American Society for Testing Materials. Annual meeting at Atlantic City, June, 1923. C. L. Warwick, 1315 Spruce St., Philadelphia, is secretary.

Society of Automotive Engineers. Summer Meeting. Spring Lake, N. J., June 19 to 23.

American Society for Steel Treating. Eastern sectional meeting, Bethlehem, Pa., June 14 and 15. Hotel reservations through George C. Lilly, Superintendent of Heat Treatment, Bethlehem Steel Co., Bethlehem, Pa.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Advances—Hoops, bands and hot rolled strip steel firmer, owing to difficulty in obtaining materials at mills; tending toward higher prices. Steel bar mills withdrawing from second quarter tonnage obligations; demand steadily increasing and prices showing tendency to advance. For reasonably early deliveries market not below $2.50 per 100 lb.; deferred shipments, $2.75. Shapes at $2.45 base, not for early delivery; $2.50 minimum on 60 day deliveries. Plates, $2.45, booked for first half; $2.50 minimum on early deliveries, with maximum at $2.75. All steel deliveries slow; mills well sold ahead.

Steel sheets up 15c. in Cleveland warehouses; galvanized, 25c. per 100 lb. higher at Pittsburgh mill. Antimony metal and copper tubing advanced ½c. per lb. in New York. Brass tubing up ½c. in both New York and Cleveland warehouses. Zinc sheets and solder also higher in Cleveland. Demand, however, somewhat ligher on finished brass and copper products. Raw linseed oil, in 5 bbl. lots, $1.10, f.o.b. New York, against $1.08 per gal. one week ago.

Declines—Copper, tin and zinc slightly lower as compared with one week ago. Latest reports, however, show zinc a trifle firmer because of foreign advances; tin, tending higher, and an improvement in tone of the copper market.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$31.55
Northern Basic	31.27
Southern Ohio No. 2	33.27
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	34.44
BIRMINGHAM	
No. 2 Foundry	27.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	33.76
Virginia No. 2	34.17
Basic	31.00
Grey Forge	31.00
CHICAGO	
No. 2 Foundry local	32.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	33.01
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	31.00
Basic	31.00
Bessemer	31.00

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	5.0
Cleveland	5½@6¼
Cincinnati	4@6
New York	5½@5
Chicago	4@5

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.65@3.25	4.34	3.90	4.15
No. 12	2.75@3.35	4.39	3.95	4.20
No. 14	2.85@3.45	4.44	4.00	4.25
No. 16	3.05@3.65	4.54	4.10	4.35
Black				
Nos. 17 and 21.	3.35@3.60	4.70	4.55	4.85
Nos. 22 and 24.	3.40@3.65	4.75	4.60	4.85
Nos. 25 and 26.	3.45@3.70	4.80	4.65	4.90
No. 28	3.50@3.75	4.90	4.75	5.00

Galvanized	Pittsburgh	New York	Cleveland	Chicago
Nos. 10 and 11.	4.00@4.25	4.90	4.80	4.85
Nos. 12 and 14.	4.10@4.35	5.00	4.90	4.95
Nos. 17 and 21.	4.40@4.65	5.30	5.20	....
Nos. 22 and 24.	4.55@4.80	5.45	5.35	5.40
No. 26	4.70@4.95	5.60	5.60	5.55
No. 28	5.00@5.25	5.90	5.90	5.85

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Steel Black	Steel Galv.	Iron Inches	Iron Black	Iron Galv.
	BUTT WELD				
1 to 3	64	52½	⅜ to 1¼	30	13
	LAP WELD				
2	57	45½	2	23	7
2½ to 6	61	49½	2½ to 4	26	11
7 to 8	58	45½	4½ to 6	28	13
9 to 12	57	44½	7 to 12	26	11
	BUTT WELD, EXTRA STRONG, PLAIN ENDS				
1 to 1¼	62	51½	⅜ to 1¼	30	14
2 to 3	63	52½			
	LAP WELD, EXTRA STRONG, PLAIN ENDS				
2	55	44½	2	23	9
2½ to 4	59	48½	2½ to 4	29	15
4½ to 6	58	47½	4½ to 6	28	14
7 to 8	54	41½	7 to 8	21	7
9 to 12	48	35½	9 to 12	16	2

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded.	54%	41%	55½%	43½%	62½%	48½%
2½ to 6 in. steel lap welded.	51%	38%	53½%	40½%	59½%	45½%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 5%. Cast iron, standard sizes, 25% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods(base)	6.03	8.00	6.10
Hoop steel	4.69	4.51	4.45
Cold rolled strip steel	7.00	8.25	7.25
Floor plates	5.65	5.46	5.65
Cold finished shafting or screw	4.20	3.90	4.10
Cold finished flats, squares	4.70	4.40	4.60
Structural shapes (base)	3.44	3.31	3.20
Soft steel bars (base)	3.34	3.21	3.10
Soft steel bar shapes (base)	3.34	3.21	3.10
Soft steel bands (base)	4.14	3.61	3.85
Tank plates (base)	3.44	3.31	3.20
Bar iron (3.00 at mill)	3.34	2.91	2.92½
Carbon tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%
Electric welding wire:			
5/32	8.50		14.00
3/16	7.35		12.25
5/32 to 1/4	7.10		11.00

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			18.00
Tin, 5-ton lots, New York			49.12½
Lead (up to carlots), St. Louis	8.25;	New York.	8.75
Zinc (up to carlots), St. Louis	7.85;	New York.	8.25

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	26.20	27.00	28.00
Antimony (Chinese), ton spot	10.25	11.50	10.50
Copper sheets, base	25.00	25@25.50	23.00
Copper wire (l.c.l.)	19.62½	21.50	16.25
Copper bars (l.c.l.)	23.75	24.75	19.50
Copper tubing (l.c.l.)	28.00	29.75	23.00
Brass sheets (l.c.l.)	21 50	24.75	18.75
Brass tubing (l.c.l.)	26.50	30.25	20.50

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Brass rods (carlots)	19.62½	21.75	15.75
Brass wire (carlots)	22.00	22.00	.....
Zinc sheets (casks)	11.50	11.25	.....
Solder (½ and ¼), (caselots)	37.00	32.00@34.00	20.00
Babbitt metal (83% tin)	65.00	59.00	36.00
Babbitt metal (35% tin)	40.00	18.50	.....
Nickel (ingot and shot), Bayonne, N. J.	29.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	32.00	.....	.....

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	55
Hot rolled rods, Grade "A" (base)	50
Cold drawn rods, Grade "A" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled rods "E"—low manganese (base)	54
Manganese nickel hot rolled rods "D"—high manganese (base)	57

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	46.00
Hot rolled sheets (base)			45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	14.75@15.25	14.00	15.50
Copper, heavy, and wire	14.50@15.00	13.50	14.75
Copper, light, and bottoms	12.50@13.00	12.00	13.75
Lead, heavy	6.25@ 6.75	6.50	7.25
Lead, tea	5.75@ 6.00	5.00	6.25
Brass, heavy, yellow	8.75@ 9.00	....	9.50
Brass, heavy, red	12.25@12.75	12.00	12.50
Brass, light	7.25@ 7.75	7 50	8.50
No. 1 yellow brass turnings	8.75@ 9.00	8.50	9.25
Zinc	5 00@ 5.50	4.50	5.25

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	22.00	18.25	18.50
IX,	20x28, 112 sheets	24.50	21.00	20.90
"A" Grade:				
IC,	20x28, 112 sheets	19.50	16.00	17.00
IX,	20x28, 112 sheets	22.00	18.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	13.00	12.20	14.50
IC,	112 sheets	13.30	12.60	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	6.30	7.25
IC,	14x20	7.25	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13	$0.15	$0.11¼
Cotton waste, colored, per lb.	.07@.12	.12	.08
Wiping cloths, 13½x13½, per lb.	.16	36.00 per M	.10
Wiping cloths, 13½x20½, per lb.	.20	52.00 per M	.13
Sal soda, 100 lb. lots	2.60	3.50	2.65
Roll sulphur, per 100 lb	2.65	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	1.10	1.10	1.15
White lead, dry or in oil	100 lb. kegs.	New York,	14.25
Red lead, dry	100 lb. kegs.	New York,	14 25
Red lead, in oil	100 lb. kegs.	New York,	15.75
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton		$7.50
Coke, prompt foundry, Connellsville	per net ton		8.00

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in	40%	50-10%	50%
1½ and 1¼x3 in. up to 12 in	20%	50%	50%
With cold punched sq. nuts	25%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	30%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	15%	3.90 net	.....
Hex. head and hex. nut bolts	20%	.....	65-5%
Lag screws, coach screws	40%	.....	60-5%
Square and hex. head cap screws	70%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	30%	45%	45%
Bolt ends, with hot pressed nuts	40%	.....	55%
Tap bolts, hex. head, list plus	20%	.....	.....
Semi-finished nuts ⅜ and larger	60%	65–10%	80%
Case-hardened nuts	50%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.00	$4.00	$3.50
Washers, cast iron, ⅜ in., per 100 lb. (net)	4.50	4.00	3.50
Washers, round plate, per 100 lb. Off list	3.00	4.50	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	1.00	2.75	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	1.00	2.75	4.00
Nuts, cold punched, sq., per 100 lb. Off list	1.00	2.75	4.00
Nuts, cold punched, hex., per 100 lb. Off list	1.00	2.75	4.00
Rivets:			
Rivets, 7/8 in. dia. and smaller	45%	50–10%	60%
Rivets, tinned	50%	50–10%	4½c. net
Button heads ¾-in., ⅝-in., 1x2 in. to 5 in., per 100 lb (net)	$5.00	$3.90	$3.75
Cone heads, ditto (net)	5.10	4.00	3.85
1½ to 1¾-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0 50	.....	0.50
Longer than 5 in *EXTRA*	0.25	.....	0.25
Less than 200 lb *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base
Copper rivets	50%	35%	50%
Copper burs	30%	35%	20%

Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.297	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, New York, per ply, 12-in. wide, per lin. ft., $2.88:			
Medium grade	30–10%	40½%	50%
Heavy grade	20–5–2½%	30–5%	40–5%
Rubber and duck:			
First grade	60%	50–10%	40-10%
Second grade	65%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$5.84	$5.84	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.50	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1 32	1 24	1.40
Cloth	3.02	2 67	3.20

New and Enlarged Shops

Machine Tools Wanted

Ill., Chicago—S. Barber, 4045 Kinzie St. —3 ton punch press (used).

Ill., Chicago—Chicago Metal Mfg. Co., 3720 South Rockwell St.—power rolls for ⅞ stock, 8 ft.

Ill., Chicago — Chicago & Northwestern R.R., 226 West Jackson Blvd., F. J. Berck, Gen. Purch. Agt.—machine tools, including lathes, borers, grinders, gate shear and drill press.

Ill., Chicago — Elgin, Joliet & Eastern R.R., 208 South La Salle St., C. H. Kenzel, Purch. Agt.—about 33 machine tools.

Ill., Chicago—Illinois Central R.R., 135 East 11th Pl., A. C. Mann, Vice Pres., Purch. Agt.—machine tools, including lathes, grinders, shapers, also threading, centering and tapping machines.

Ill., Chicago—Live Poultry Transit Co., 431 South Dearborn St.—complete machinery and equipment for $50,000 car repair shop at Kenton, O.

Ill., Galesburg — The Machine Shop, Drawer 27—double crank back geared punch press with 42 in. bed, about 8 in. stroke.

Ill., Peoria—Peoria & Pekin Union Ry. Co., E. F. Stock, Purch. Agt.—three lathes, milling machine and slotter.

Ind., Indianapolis — R. Campbell, 1516 Washington St.—sheet metal working equipment.

Ind., Liberty Mills — J. F. Rittenhouse Mfg. Co.—shear for cutting ½ in. soft steel.

Kan., Wichita—J. A. Cox, 806 North Main St. (garage)—drill press and lathe (used preferred).

Kan., Wichita—Elgin Garage, 811½ North Main St.—power drill press and power lathe.

Kan., Wichita—Herman Motor Co., 212 West Douglas St.—machine shop equipment, including lathes, drill press, belting and hangers.

Ky., Owensboro—Bolger & Medley—machine shop equipment, also brick and tile making machinery.

Md., Baltimore—Chicago Nipple Mfg. Co., 1st Ave. and 9th St.—2½ to 4 in. pipe machine, Landis preferred.

Mass., Winthrop—J. C. McMurray, 15 Putnam St.—equipment for new garage and service station.

Mich., Detroit—Genl. Aluminum & Brass Co., St. Aubin St. and East Grand Blvd.—one 8 in. stroke punch press, plain type.

Mich., Detroit — Lopshire & Schlinger, 2318 Vermont Ave.—equipment for small machine shop for experimental purposes.

Minn., Minneapolis—Northern Mchy. Co., 503 South 6th St.—New Britain No. 23 chucking machine with belt drive (used).

Mo., Kansas City—Economy Lamp Co., 1705 Washington St.—50 or 60 in. square shear and a power screw machine.

Mo., Marionville—O. K. Motor Co.—combination re-boring cylinder and polisher machine for various makes of cars and tractors, adjustable to different sizes, motor power.

Mo., St. Louis—Wabash Ry., Ry. Exch. Bldg., T. J. Frier, Purch. Agt.—squaring shear for 14 gauge material.

Mo., Springfield—Consolidated Motor Co., C. E. Woodruff, Mgr.—combination lathe and miscellaneous garage and repair equipment.

N. Y., Buffalo—Dempka & Knapp, 145 East Tupper St.—lathe shaper, milling machine and small drill press.

N. Y., Buffalo—W. E. Gutekanst, 59 Altruria St.—equipment and one 1,000 gal. gasoline tank and pump for service station on South Park Ave. and Ladner St.

N. Y., Buffalo—H. J. Hambleton, 73 La Force Pl.—equipment, also one 12,000 gal. gasoline tank and pump for service station at 1530 Niagara St.

N. Y., Buffalo—Hotel Statler Co., Inc., West Mohawk St. and Delaware Ave.—repair shop equipment and four 1,000 gal. gasoline tanks and pumps for proposed garage.

N. Y., Buffalo—J. Riley, 2239 Bailey Ave. —service station equipment and one 1,000 gal. gasoline tank and pump.

N. Y., Buffalo—J. J. Rooney, 760 Abbott Rd.—complete gasoline and automobile service station equipment.

N. Y., Buffalo—W. Schaur, 1451 Sycamore St.—gasoline and service station equipment, including 1,000 gal. tank and pump.

N. Y., Buffalo—S. Shilen, 1 Alma Ave.—automobile repair shop equipment and one 1,000 gal. gasoline tank and pump for proposed garage on Kensington and Bailey Aves.

N. Y., Buffalo—C. Vesper, 1057 East Ferry St.—gasoline and service station equipment, including tankage and pumps.

N. Y., Canton — St. Lawrence Garage, Main St. and Riverside Dr., D. E. Sullivan, Purch. Agt.—high speed lathe and power operated metal saw.

N. Y., Clayton—C. C. Frazier (motor express line)—one portable electric drill, 220 volt, a.c.

N. Y., Endicott—Binghamton Oil & Gas Producing Co., c/o C. E. Bennett—machinery, tools and equipment for service and distributing station for gasoline, oil, etc.

N. Y., Gouverneur — Gates & Labow, Katzman Block (steam fitting, sanitary work and repairs)—pipe cutting and threading machine up to 6 in., also power operated forming rolls for sheet metal cornice work.

N. Y., Jamestown—C. Lyman, 217 East 6th St.—machinery, tools and complete equipment for gasoline service station on Pine St.

N. Y., Long Island City—Metal Stamping Co., 13th St. and East Ave. — three Toledo or Bliss presses.

N. Y., Mohawk—J. C. Harter, Warren St. (steam fitting, heating, etc.)—power operated pipe cutting and threading machine.

N. Y., New York—Todd Shipbuilding Co., 25 Bway.—miscellaneous machine tools for machine shop at Mobile, Ala., and for shipbuilding plant at New Orleans, La.

N. Y., Ogdensburg—L. Carr Co., Main St. (machine shop and repairs)—upright post drill, high speed twist drills and power operated carborundum wheel stand.

N. Y., Ogdensburg — C. E. Castle Co., Greene St., C. E. Madlin, Purch. Agt.—forge castings for built in forge with blower, electrically driven; one internal grinder.

N. Y., Ogdensburg—C. G. Miller, Inc., 25 Main St. (manufacturer of farm implements), H. K. Miller, Purch. Agt.—radial drill, milling machine, broach, drop hammer and small tools.

N. Y., Tupper Lake — L. Scropie Co. (quarry and stone products)—electrically driven air compressor; tank, 200 lb. pressure; air drill; portable forge.

N. Y., Utica—C. Barrett, 1211 Miller St. —speed lathe for machine and motor repair shop (new or used).

N. Y., Utica—A. Canciato Co., 770 Bleecker St. (machine shop, garage and repairs)—air compressor; tank and tubing, 150 to 200 lb. pressure; 12 to 14 in. engine lathe (new or used).

N. Y., Utica — Mohawk Valley Heating Co., 302 Broad St.—one power operated pipe cutting and threading machine.

N. Y., Watertown—Briceland & Cavanaugh, 800 Franklin St., (machine shop and garage), T. Briceland, Purch. Agt.—upright post drill, high speed twist drills, electrically driven compressor and tank.

N. C., Charlotte — Southern Spindle & Flyer Co., West 1st St., (manufacturer of textile machinery), address company purchasing agent—complete line of machinery for machine shop.

O., Burton—Lakefield Farm—foot power machinist lathe (used).

O., Columbus—Coats Steam Car Co., 1675 South High St., G. B. Frank, Purch. Agt.—three 24 in. lathes, two medium size drill presses and other equipment for the manufacture and assembling of automobiles.

O., Youngstown—J. Bell, Glenwood St. —machinery, tools and equipment, including air compressor, for gasoline and service station.

Pa., East Pittsburgh—Westinghouse Electric & Mfg. Co.—about 80 tools, including radial drills, milling machines, saws, drill presses, lathes, grinders, etc.

Pa., Erie—Jarecki Mfg. Co. (manufacturer of iron and steel goods, including oil and gas well supplies) — machinery and equipment for 2 story addition to plant at Tulsa, Okla.

Pa., Manayunk (Phila. P. O.)—Robinson Iron & Steel Co. (steel fabrication)—punching machine, shears, hammers, compressor, etc.

Pa., Phila.—Ferco Machine Co., Lawrence and Tioga Sts. (machine shop)—lathe, drills, presses, etc., for new shop.

Pa., Phila.—J. Peters & Son Co., 1934 North Front St., (manufacturer of hardware), J. Peters, Jr., Purch. Agt.—drill presses, lathes, punches, belting, shafting, etc.

Pa., Phila.—Phila. Badge Co., 942 Market St. (metal and badge works) — power knuckle joint press.

Pa., Phila.—Stewart & Romaine Mfg. Co., 124 North 6th St., (manufacturer of rivets and bolts), M. Romaine, Purch. Agt.—punch and forming presses, electric ovens, also screw cutting machines.

Pa., Pittsburgh—Bessemer & Lake Erie R.R., Carnegie Bldg., (subsidiary of Carnegie Steel Co.), W. A. Parker, Purch. Agt. —face grinder and other equipment.

Pa., Scranton—Wyoming Motor Car Co., 416 North 6th Ave.—machinery and equipment, including air compressor, grinding and boring machines, for proposed $40,000 garage and service station on Wyoming Ave.

Pa., Wilkes-Barre—Huntington Mchy. & Supply Co., East South St.—small tools and equipment for plant, including drills, etc.

R. I., Providence — D. J. Carlson, 213 Sumter St.—automobile repair shop equipment for proposed garage on Brook St.

R. I., Providence—Mack Motor Truck Co., 935 Broad St. (truck repairs)—equipment for small addition to service and repair station on Broad St. and Adelaide Ave.

R. I., Providence—C. Petleruti, 24 Home Ave.—small machine shop equipment for proposed garage and service station on Chalkstone Ave.

Tex., Bonham—Catron Mfg. Co., Inc. (machine shop and factory)—circular saw, 10 to 12 in., motor driven; one pipe threading machine, ¼ to 2 in., power driven; one set square shears to cut 16 gauge iron, not less than 40 in. wide; emery stand, motor driven; one punch press that will punch 4½ in. holes in series.

Wis., Appleton—A. J. Tschank, 652 Richmond St.—sheet metal working machinery, including brake, bender and roll.

Wis., Augusta—The Ford Auto Co.—power machinery and automobile repair equipment, including press, compressor, etc., for proposed $40,000 garage and repair shop.

Wis., Beloit—N. B. Gaston Co., 715-21 2nd St., T. I. Gaston, Purch. Agt.—machinery and shop equipment for the manufacture of scales and weighing devices.

Wis., Fort Atkinson—Ford Garage, 18 South 3rd St.—drill press, air compressor, gasoline storage tank and pump.

Wis., Fox Lake—G. Roberts (garage)—small tools, air compressor, also gasoline storage tank and pump.

Wis., Hammond—C. Datwyler—power machinery, automobile repair machinery and shop equipment for proposed garage, repair and machine shop.

Wis., Milwaukee—Wisconsin Forge Co., c/o E. B. Leverenz, 1004 4th St. (manufacturer of castings)—several 50 ton hydraulic presses; several forging machines, 2 and 3 in.; electric furnace.

Wis., Plymouth—J. Mattey—automobile repair equipment, including press, compressor, etc., also power machinery for proposed $50,000 garage.

Ont., London—Tennent & Wilkinson, 86 York St.—complete equipment for garage and repair shop, to replace that which was destroyed by fire.

Que., Montreal — P. P. Rivet, 210 Des Ormeaux St.—complete equipment for garage and automobile repair shop.

Machinery Wanted

Ark., Camden—Camden Steam Laundry, F. P. Cooper, Supt.—complete unit of steam heated equipment, exclusive of extractor and flat work ironer.

Calif., Venice—Imperial Ice Co.—machinery and equipment to increase capacity of ice plant from 50 to 102 ton per day.

D. C., Wash.—J. A. Wetmore, Acting Supervising Archt., Treasury Dept.—receiving bids until Apr. 16 for an ice making and refrigerating plant for the United States Veterans' Hospital, Chelsea, N. Y.

Fla., Lake Wales—Townsend Sash, Door & Lumber Co., J. Townsend, Pres.—machinery and equipment for addition to plant, including planer, molder, mortiser, ripping machine and jointer.

Ind., Marion—Indiana Genl. Service Co.—coal handling machinery and equipment for $350,000 coal storage plant in connection with lighting plant.

Ia., Des Moines—Bd. Educ., C. L. Garton, Secy.—vocational equipment for two new junior high schools.

Ia., Dubuque—The city, O. E. Carr, City Hall, City Mgr.—two air compressors, coal bunkers and ash handling equipment for pumping station.

Kan., Lansing — The state, A. Helsof, Supt. of Mines—rock drilling, rock cutting and coal cutting machines.

Kan., Mound City—J. A. Martin—power lime pulverizer.

Kan., Wichita—S. Bushong Candy Co., 1018 West Douglas St.—belting, hangers, pulleys, shafting, pullers and mixers for candy factory.

Kan., Wichita—J. Miller, 742 Hendrix Ave.—power job printing press with throw-off attachment.

Ky., Frankfort—Acme Road Mchy. Co.—machinery and equipment for proposed $50,000 road machinery plant at Lowville, N. Y.

Ky., Hazard — Columbus Mining Co.—mining machinery and equipment, including transmission and conveying machinery, screening, shakers, etc.

Ky., Louisville—United States Engineer Office, P. O. Box 73—35 ton, 1 in. round rods soft steel, shop lengths, f.o.b. Addison, estimated cost $2,400.

Ky., Walton—J. L. Reeves—ice manufacturing machinery and equipment.

Me., Bath—Times Co. (job printers)—power Liberty folder.

Mass., Somerville—J. Hegy, 71 Bow St.—equipment for new bakery on Somerville Ave.

Mich., Detroit—Butt Welding & Mfg. Co., 4847 Bellevue Ave.—welding equipment.

Minn., St. Paul—Amer. Wet Wash Laundry Co., 385 Rice St., P. Gilfillan, Purch. Agt.—additional equipment, including three wash machines, one mangle, etc., for proposed 1 story, 50 x 120 ft. laundry at 455 University Ave.

Miss., Jackson—J. A. Roell—automatic machine for the manufacture of broom handles.

Mo., Kansas City—J. A. Ames Body Wks., 1817 Holmes St.—20 in. power bandsaw.

Mo., Seligman—Silver Lake Mining Co., T. R. Gilliam, Purch. Agt.—crushers, belting, hangers and pulleys.

Neb., Grand Island—Teeter-Homan Co.—gasoline and oil pumping system for proposed $40,000 garage.

N. Y., Binghamton — G. Sullivan, Riley Pl.—complete equipment for new tinshop.

N. Y., Boonville — Boonville Mineral Springs Co. (mineral waters and soft drinks), A. J. Lowery, Purch. Agt.—additional bottling machinery and equipment.

N. Y., Brooklyn—L. Levine, 37 Maspeth Ave. (knit goods)—several circular knitting machines, all styles.

N. Y., Buffalo—G. Calandra, 147 Stanton St.—machinery and equipment for the manufacture of ice cream cones.

N. Y., Buffalo—M. A. Fielding, 17-21 Orange St.—coolers, dough mixers, bread ovens, etc., for proposed bakery.

N. Y., Buffalo—Genl. Castings Corp., 577 Tonawanda St.—foundry equipment, to replace that which was destroyed by fire.

N. Y., Buffalo—F. L. Grampp, 72 Walden Ave.—woodworking machinery for proposed addition to wagon and automobile works.

N. Y., Buffalo—Hoefler's Ice Cream Co., 296 Connecticut St.—machinery and equipment for new ice cream factory at Tonawanda.

N. Y., Buffalo—Kelley Island Lime & Transportation Co., West Buffalo River—dry kiln machinery and equipment.

N. Y., Buffalo — A. Nowak, 204 Coons Ave.—machinery and equipment for glass factory.

N. Y., Buffalo—E. C. Randall, Iroquois Bldg.—complete equipment, including three 15,000 gal. tanks, two pumps, etc., for gasoline distributing station on Hopkins and Colgates Sts.

N. Y., Buffalo—L. Ruddank, 331 William St.—bakeshop equipment, including gas burning ovens.

N. Y., Buffalo—G. C. Strauss, High and Washington Sts.—machinery and equipment for small plant for the installation of automobile springs and service.

N. Y., Canajoharie—Underwood & Fiume, H. Underwood, Purch. Agt.—special textile machinery for knitting silk underwear and for the manufacture of plush.

N. Y., Cortland—E. J. Mackecknie Co., 127 Elm St. (trunk factory)—small double surface planer (new or used).

N. Y., Geneva—Allegretti Mfg. Co., 624 Exchange St.—machinery and equipment for 3 story addition to plant for the manufacture of hardware specialties.

N. Y., Granville—E. R. Norton (quarry)—power operated stone saw and heavy duty compressor for drilling.

N. Y., Holberton—A. H. Phillips—ice manufacturing machinery and equipment.

N. Y., Jamestown — Alliance Furniture Co., 615 Allen St.—woodworking machinery and equipment for 4 story addition to plant.

N. Y., Jamestown—Jamestown Panel Co., 34-40 Steele St.—dry kiln machinery and equipment.

N. Y., Jamestown—L. Lucas Co., Ross St.—complete machinery and equipment for $15,000 plant for the manufacture of incense.

N. Y., Johnson City—D. Kennedy—special machinery and equipment, including power presses, molds, curing trays and conveying machinery, for the manufacture of cement brick.

N. Y., Lacona—Blount Lumber Co., Inc., C. Kirsch, Supt.—one 5 ton and two 2½ ton triple chain hoists.

N. Y., Lacona—Lacona Milk Corp., A. T. Blount, Purch. Agt.—five one ton triple block chain hoists.

N. Y., Mount Morris—Winters & Profit, (canners), J. C. Winters, Jr., Purch. Agt.—filling machinery for glass containers.

N. Y., New York—Lion Brewery of New York City, Columbus Ave. and 108th St.—ice manufacturing machinery for proposed plant on Ludlow and Whitlock Aves.

N. Y., New York—Wortman & Litter, 5 Mulberry St. (paper folding machines)—one 6 x 30 x 30 in. planer.

N. Y., North Tonawanda—Frontier Mfg. Co., Erie Ave. (manufacturer of oils)—machinery and equipment to enlarge plant.

N. Y., Oxford—Oxford Basket Co., E. S. Sharp, Purch. Agt.—cutting off saw rig and table; buzz saw with log carrier and frame; double surface planer.

N. Y., Schenectady—General Electric Co., River Rd.—machinery and equipment for plant for the manufacture of electric transformers at Erie, Pa.

N. Y., Utica — Campbell Refining Co., Kendrick Bldg.—oil storage and distributing machinery and equipment for $55,000 station.

N. Y., Utica — Dairymen's League Co-operative Assn., H. A. Seick, 222 Lafayette St., Purch. Agt.—machinery for 20 ton daily capacity ice plant, complete with synchronous motors.

O., Bellaire—Grains of Health Co., Inc.—machinery and equipment for plant for the manufacture of a substitute for coffee.

O., Cincinnati—Forster-Treuheit Co., 332 West 4th St. (artificial limbs)—fleecing machine for fleecing the inside of stump socks.

O., Columbus—French Door & Window Co., 1370 East Fulton St., A. C. Uhle, Mgr.—woodworking machinery to increase capacity of plant.

O., Columbus—Weinman Pump & Mfg. Co., 284 Spruce St., W. N. Weinman, Pres.—additional machinery to increase capacity of plant.

O., Ironton—C. Turley, Pres. refractory machinery and equipment.

O., Piqua—Piqua Paper Box Co.—machinery and equipment for 3 story plant for the manufacture of paper boxes.

O., Toronto—The city—one crane for filtration plant.

Pa., Akeley—F. Thorpe, R. 1—complete buzz saw outfit.

Pa., Allentown—Norway System Laundry Co., Park Ave. and Union St.—laundry machinery and equipment for $40,000 plant.

Pa., Bethlehem—Kurtz Bros., Furniture Co.—additional woodworking machinery and equipment for large furniture factory.

Pa., Carbondale—Clover Leaf Mfg. Co. (manufacturer of textile machinery)—machinery and equipment for plant at Honesdale.

Pa., Carnegie—A. F. Steinmetz, 210 Main St.—conveying equipment, ovens and other equipment for bakery.

Pa., Columbia—W. W. Fairer—machinery and equipment for the manufacture of metal bottle caps.

Pa., Easton—Binney & Smith Co. (manufacturer of lamp black products)—machinery and equipment for addition to plant.

Pa., Erie—Erie Fdry. Co.—equipment for 2 story addition to foundry.

Pa., Forty Fort (Kingston P. O.)—General Cigar Co.—machinery and equipment for cigar factory.

Pa., Hanover—Titlow & Pfeiffle (manufacturers of hosiery)—textile machinery and equipment, to replace that which was destroyed by fire. Loss $80,000.

Pa., Koppel — Bd. Educ. — vocational equipment for $150,000 school.

Pa., Phila.—A. B. C. Enclosure Co., 439 Berks St., (woodworking), J. Bornheim, Purch. Agt.—tenoners, bandsaws, boring machines, sanders, shafting, belts, etc.

Pa., Phila. — F. Boyer, 5641 Vine St. (woodworker)—one tenon machine complete.

Pa., Phila.—J. and J. Dobson, Inc., 809 Chestnut St. (textiles), R. W. Hillegas, Purch. Agt.—cards, combs, spindles, beltings, shaftings, etc.

Pa., Phila.—Edgewater Dyeing & Finishing Co., Lorresdale and Frankford Aves.—vats, wringers, dyeing and measuring machines, etc.

Pa., Phila.—G. D. Hetzel Co., Front and Broomall Sts.—additional looms and accessories for textile mill.

Pa., Phila.—Hinkle Fdry. Co., Paul and Van Dyke Sts.—electric cranes, furnaces, tumblers, etc., for foundry.

Pa., Phila.—Pollock-Huston Co., Dauphin and Tulip Sts. (manufacturer of carpet), A. Huston, Purch. Agt.—additional Broad & Marron looms with accessories, for new mill.

Pa., Phila.—Quaker City Morocco Co., 2653 North Reese St. (manufacturer of leather)—buffing machines, splitters, etc., for new factory.

Pa., Phila.—G. C. Royle & Co., Inc., 4090 Frankford Ave., G. Royle, Jr., Purch. Agt.—24 broad looms, belting, motors, etc., for textile mill.

Pa., Phila.—A. Smith & Co., 13th and Cherry Sts. (printers)—cylinder presses, stitchers, paper cutters and binding machinery.

Pa., Phila.—W. D. Whitaker, Emerald and Westmoreland Sts. (manufacturer of rope and twine)—spindles, combs, spinning machines, belting, etc., for new mill.

Pa., Pittsburgh—Andrews Eng. Co., Empire Bldg. (steel construction)—10 or 15 ton crane.

Pa., Scranton — Wahl Bakery, 407-409 Adams Ave.—equipment for new bakeshop.

Pa., Susquehanna — Susquehanna Dairymen's League, W. C. Deakin, Pres.—machinery and equipment, including conveying machinery, for proposed milk plant.

Pa., Titusville — Titusville Forge Co.—forge shop equipment for the manufacture of piston rods, also equipment for the manufacture of small turned metal products.

Pa., West Reading—Narrow Fabric Co.—silk mill machinery and equipment, including looms, etc., for plant at Eyomissing.

S. C., Charleston—E. P. Burton Lumber Co., Cosgrove Ave.—machinery and equipment for lumber mill, to replace that which was destroyed by fire.

Tenn., Chattanooga — Browning Hosiery Mills, 7 East 16th St.—fifteen 200 needle, 3¼ in. cylinder, Model K and K G knitting machines (used).

Tenn., Johnson City—Southern Refrigerator Co., H. W. Johnson, Mgr.—ice making machinery and equipment for proposed plant at Welch, W. Va.

Tenn., McKenzie — City Council — ice manufacturing machinery and equipment for proposed plant.

Tenn., Nashville—The state, L. W. Pope, State Prison, Dir. of Institutions—$8,000 worth of equipment for ice plant at state prison.

Tex., Abilene—M. M. Jones, 1217 Grape St. (newspaper)—linotype machinery.

Tex., Dallas—G. C. Worthington, 1204 Dallas County Bank Bldg., (contractor)—20 ft. trimmer, 42 in. fan and blow pipe.

Tex., Eastland—Arab Gasoline Co.—machinery and equipment for proposed $150,000 refinery.

Va., Culpeper—Culpeper Creamery Co.—4 ton ice machine.

Va., Richmond—Old Dominion Sand & Gravel Co., 17th and Dock Sts.—drag line bucket outfit.

W. Va., Charleston—Bd. of State Control, S. Larkin, Pres.—vocational equipment for $230,000 trades school, to replace that which was destroyed by fire.

W. Va., Sistersville—Chadderton & Bradley—ice making machinery and equipment.

W. Va., Warwood—United States Corrugated Fibre Box Co.—fibre box making machinery and equipment for $27,000 addition to plant.

Wis., Arcadia—A-G Creamery Co., A. G. Wieland, Purch. Agt.—one testing machine, one power churn and belting.

Wis., Green Bay—H. Dietsch, 520 Cedar St. (dairy products)—refrigeration machinery, power churn, separator, belting and shafting.

Wis., Hartford — The city, W. Radtke, City Clk.—quotations until Apr. 17 for one 500 ft. air compressor.

Wis., Marinette—A. Z. White, 2344 Riverside Ave.—flour mill machinery, including grinders, crushers and sifters.

Wis., Milwaukee—S. E. Copps, 333 Hartford Ave.—stone crushing machinery, capacity 500 tons per day.

Wis., Milwaukee—Eastern Hand & Wet Wash Laundry, 612 Walnut St., M. H. Cohen, Purch. Agt.—power washing machines, manglers and extractors.

Wis., Milwaukee — Milwaukee Parlor Frame Co., 1173 26th Ave. (manufacturer of furniture frames), G. A. Kelly, Purch Agt.—8 in. sticker and 2 spindle shaper, both with electric motor drive.

Wis., Milwaukee — North End Printing Co., 1671 6th St., G. J. Holtz. Purch. Agt.—16 or 19 in. paper cutting machine.

Wis., Milwaukee—E. C. Schumacher, 114 Lincoln Ave. (carpentry and millwork)—Universal woodworking macnine of several operations.

Wis., Milwaukee—Seamless Steel Tubes Co., 27th and Canal Sts., E. J. Lansing, Purch. Agt.—welding machines.

Wis., Milwaukee—Sewerage Comn., 508 Market St., J. H. Fowles, Secy.—two 2 ton, 3 motor electric traveling cranes; three 10 ton hand operated traveling cranes; or three 10 ton traveling cranes with motor hoisting apparatus, bridge and trolley, hand operated.

Wis., Plymouth—Phoenix Cheese Co., R. A. Harbach, Mgr.—30 ton ice machine, also refrigerating and power machinery.

Wis., Sheboygan—E. Mohr, 711 North 8th St.—baking machinery, including mixers, power equipment, belting, etc.

Wis., Superior — Douglas Creamery & Produce Co., c/o L. T. Powell, 1st Natl. Bank Bldg.—power churns and separators.

Wis., Verona—W. Wild—equipment for proposed blacksmith shop.

Wis., Waukesha—Waukesha County, c/o C. J. Hahn, Engr., Court House—gravel pit equipment, including rock crusher.

N. S., Oxford—Oxford Mfg. Co., Ltd. (textiles)—one 48 x 48 finished carding machine, Davis & Ferber make.

Ont., Brantford—Brandon Shoe Co., A. Brandon, Mgr.—machinery and equipment for shoe factory, to replace that which was destroyed by fire.

Ont., Hamilton—Hamilton Uniform Cap Co., 214 King William St., A. Uger, Mgr.—special machinery, to replace that which was destroyed by fire.

Ont., Larder Lake—Maple Leaf Mining Assn., address A. E. Ilett, Woolworth Bldg., Watertown, N. Y.—machinery and equipment for gold mining operators, including ore crushers, concentrating tables, air compressors, drills, mine pumps, elevator and conveying equipment, also assay machinery and equipment.

Ont., Renwick — Kaiser & Laurier—equipment for extensive deep oil well drilling.

Metal Working Shops

Calif., Emeryville—The Detroit Steel Products Co., 251 Kearny St., San Francisco, is receiving bids for the construction of a 1 story factory and warehouse on 64th and Boyle Sts., here. Cost will exceed $25,000. W. J. Miller, 417 Market St., San Francisco, Archt.

Calif., Los Angeles—The Black & White Taxi Co., Alexandria Hotel, awarded the contract for the construction of a 3 story, 100 x 125 ft. garage on Olive and 4th Sts.

Calif., Los Angeles—The city will soon receive bids for the construction of a high school, including auditorium and shop buildings, for Fremont School on San Pedro St. Estimated cost $500,000. E. Bergstrom, Citizens Natl. Bank Bldg., Los Angeles, Archt.

Calif., San Francisco — D. O'Neill, 273 Minna St., will build a 1 and 2 story machine shop on Folsom St. near 4th St. Estimated cost $20,000.

Calif., San Leandro (Oakland P. O.)—The Durant Motors Co. of California, 10910 East 14th St., Elmhurst (Oakland P. O.), is having plans prepared for the construction of a 2 story, 80 x 600 ft. automobile body factory, here. Private plans.

Conn., Hartford—S. Vogel & Sons, Rice Court, are having plans prepared for the construction of a 1 story, 62 x 190 ft. garage and shipping building on High St. Estimated cost $100,000. F. C. Walz, 407 Turnbull St., Hartford, Archt.

Kan., Wichita—E. W. Singleton and H. J. Ellis, Douglas Ave., are having plans prepared for the construction of a 1 story, 79 x 120 ft. garage. Estimated cost $25,000. Private plans. Herman Motor Co., 212 West Douglas St., lessee.

Ky., Louisville—The Klein Motor Co., 949 South 3rd St., plans to build a 5 story, 50 x 200 ft. salesroom, garage, trimming room, paint and repair shop at 942-44 South 3rd St. Estimated cost $125,000. Engineer or architect not selected.

Mich., Battle Creek—The Michigan Metal Products Co. will soon award the contract for the construction of a 1 story, 60 x 100 ft. and 25 x 50 ft. machine shop and office building additions to its factory on 21st St. Estimated cost $35,000. A. B. Chanel, Post Bldg., Archt.

Miss., Shelby—The A. R. Carnes Motor Co. has had plans prepared for the construction of a 60 x 130 ft. garage. Estimated cost $40,000. Alsop & Callahan, 752 Randolph Bldg., Memphis, Tenn., Archts.

Neb., Grand Island—The Teeter-Homan Co. awarded the contract for the construction of a 1 story, 132 x 132 ft. garage. Estimated cost $40,000.

N. J., Elizabeth — Day & Zimmerman, Archts., 6th and Chestnut Sts., Phila., Pa., are receiving bids for the construction of a 1 and 2 story, 165 x 600 ft. type factory, here, for the Amer. Type Founders Co., Communipaw Ave., Jersey City. Noted Dec. 28.

N. Y., Buffalo—The Genl. Castings Corp., 577 Tonawanda St., plans to rebuild its foundry, which was destroyed by fire. Cost between $50,000 and $60,000. Engineer or architect not announced.

N. Y., New York—The Brad Realty Co., c/o J. DeHart, Engr. and Archt., 1039 Fox St., will build a 1 story, 100 x 100 ft. garage on East 137th St. Estimated cost $30,000.

N. Y., Ogdensburg—The C. E. Castle Co., Greene St., has had plans prepared for the construction of a machine shop and garage. Cost between $40,000 and $50,000. G. E. Wilson, Archt.

North Carolina—The Atlantic Coast Line R.R., Atlantic Coast Line Bldg., Wilmington, plans to expend $26,000,000 for improvements, including shops at various points, large coach and repair shop at Rocky Mount and enlargement of shops at Wilmington, etc., J. E. Willoughby, Ch. Engr.

O., Bridgeport—W. McConnoughy, Main St., awarded the contract for the construction of a 3 story, 44 x 67 ft. garage and sales station. Estimated cost $40,000.

O., Cleveland — The Central Brass Co., 6203 Cedar Ave., awarded the contract for the construction of a 1 story, 102 x 140 ft. foundry on East 55th St. and Bragg Court. Estimated cost $50,000. H. H. Klein, Secy.

O., Cleveland—The Indian Oil Products Co., 7010 Harvard Ave., has had plans prepared for the construction of a 1 story, 66 x 150 ft. garage at 3852 West 25th St. Estimated cost $40,000. J. Roski, Mgr. Private plans.

O., Cleveland—L. A. Skeel, 7016 Euclid Ave., awarded the contract for the construction of a 1 story, 102 x 165 ft. and a 2 story, 85 x 120 ft. store, office, service station and garage, at 7111 Euclid Ave. Estimated cost $150,000.

O., Cleveland — The Superior-Forty-Ninth Co., c/o G. Paul, 611 Fidelity Mortgage Bldg., has had plans prepared for the construction of a 1 story, 182 x 203 ft. garage on Superior Ave. and East 51st St. Estimated cost $75,000. J. F. Steffens, 611 Fidelity Mortgage Bldg., Archt.

O., East Liverpool—The Chevrolet Motor Co., c/o J. A. Trotter, is having plans prepared for the construction of a 3 story, 75 x 85 ft. garage on Market St. Estimated cost $50,000. A. McHenry, c/o Potters Lumber Co., East Liverpool, Archt.

O., East Liverpool—The Liverpool Motor Car Co. is having plans prepared for the construction of a 2 story, 50 x 135 ft. garage. Estimated cost $50,000. Private plans.

O., Mansfield—The Standard Oil Co. of Ohio, East Ohio Gas Bldg., Cleveland, is having plans prepared for the construction of a 1 story warehouse and garage, here. Estimated cost $40,000. E. B. Wagoner, East Ohio Gas Bldg., Cleveland, Archt.

O., Salem — The Victor Stove Co., 208 Depot St., is receiving bids for the construction of a 1 story, 80 x 150 ft. foundry. Private plans.

O., Steubenville—The Nash Brandt Co., 537 Lawson Ave., will receive bids until Apr. 6 for the construction of a 2 story, 70 x 85 ft. garage on West Market St. Estimated cost $60,000. Peterson & Clark, Steubenville, Archts.

O., Tiffin—W. H. Roe and Associate Engineers, S. H. Leister, Engr. in charge, are receiving bids for the construction of a 55 x 170 ft. garage for F. S. Sell.

O., Warren—The Salzenbacker Motor Co. has had plans prepared for the construction of a 1 story, 35 x 46 ft. garage. Estimated cost $40,000. Watson Eng. Co., 4614 Prospect Ave., Cleveland, Archts.

Pa., Beaver Falls — T. F. Daquila, 716 11th St., is having plans prepared for the construction of a 3 story, 43 x 90 ft. garage on 7th Ave. and 14th St. Estimated cost $60,000. Carlisle & Sharrer, Jenkins Arcade, Pittsburgh, Archts.

Pa., Clearfield—W. B. Holmes, Jr., has purchased site and plans to build a 2 story, 50 x 100 ft. garage, including storage house, repair and paint shop, on Merrill and Williams Sts. Estimated cost $40,000.

Pa., Etna (Pittsburgh P. O.)—The Etna Buick Co., 425 Butler St., awarded the contract for the construction of a 2 story, 75 x 100 ft. addition to its garage. Estimated cost $40,000. Noted Feb. 8.

Pa., Phila.—F. A. Nardy, 3840 Spring Garden St., will build a 2 story, 100 x 138 ft. garage. Estimated cost $60,000. Noted Dec. 14.

Pa., Pittsburgh — W. W. Martin, 5847 Center Ave., (motor trucks), awarded the contract for the construction of a 1 story, 60 x 190 ft. sales and service station at 5710 Penn Ave. Estimated cost $40,000.

Pa., Pittsburgh—The Pittsburgh Transformer Co., Columbus and Preble Sts., awarded the contract for the construction of a 1 story, 60 x 80 ft. addition to its factory.

Pa., Scranton—The Wyoming Motor Car Co., 416 North 6th Ave., awarded the contract for the construction of a 1 story, 40 x 150 ft. garage on Wyoming Ave. Estimated cost $40,000.

Pa., Uniontown—H. W. Altman, Archt., Fayette Title & Trust Bldg., is receiving bids for the construction of a 2 story, 41 x 70 ft. garage for the Uniontown Automobile Co. Estimated cost $50,000. Noted Mar. 15.

Tex., Dallas—W. Morriss, 1017 Elm St., awarded the contract for the construction of a 2 story, 88 x 160 ft. garage on Ervay and Cadiz Sts. Estimated cost $50,000.

W. Va., Huntington—C. L. Ritter, Ritter Bldg., awarded the contract for the construction of a 3 story, 60 x 160 ft. garage on 4th Ave. Estimated cost $70,000.

W. Va., Wheeling—The Hazel Atlas Glass Co., Consolidated Life Insurance Bldg., is having plans prepared for the construction of a 2 story, 60 x 150 ft. machine shop. Estimated cost $40,000. C. W. Bates, 77 12th St., Wheeling, Archt.

Wis., Augusta—The Ford Auto Co. awarded the contract for the construction of a 1 story, 40 x 100 ft. garage and repair shop. Estimated cost $40,000.